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DETROIT

THE ENGINEER.

The British Industries Fair at Birmingham.

Descriptive Supplement No. 1.

The British Industries Fair at Birmingham.

ON Monday next, February 17th, there opens at Birmingham the Engineering and Hardware Section of the British Industries Fair. Last year the experiment was tried of holding this section of the Fair in May. But, as a return has been made to the earlier practice, despite the lesser expectation of fine and warm weather, it is to be assumed that the change of date did not prove satisfactory. On the occasion of last year's Fair, we mentioned in the Introduction to the first of our special Supplements dealing with the exhibits that there was a regrettable lack of the heavier engineering products. In truth, as the years have passed we have noticed the tendency of the Fair to become more and more concerned with the lighter classes of engineering products more suitable for domestic than for industrial purposes. That tendency grows more obvious every year, and this time the lighter exhibits predominate to so great an extent as almost to reduce heavier engineering to insignificance. Even in the Outdoor Section, which has latterly been the more interesting part of the Fair to the engineer, the defection of certain manufacturers has reduced its attraction. Indeed, it seems to us that the Engineering and Hardware Sections are destined to become within a very few years mainly of interest to garages, minor engineering works of a similar nature, and the retailer of domestic appliances. The Fair has always constituted a wonderful display of such products, and even in that limited field would, no doubt, continue to enjoy success.

In the circumstances, the compilation of the present Supplement and a second to be published with our next issue has been beset with difficulties.

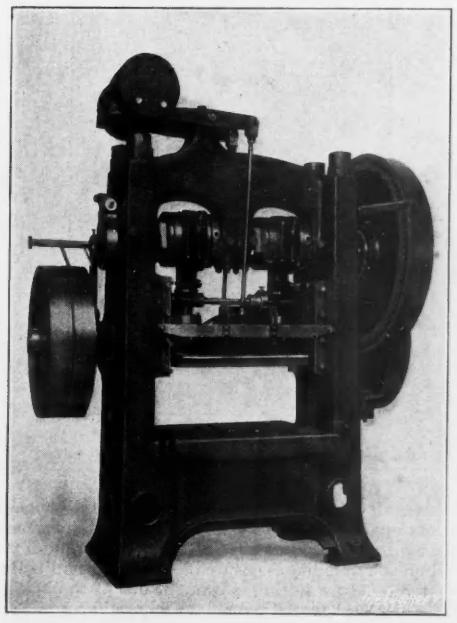

FIG. 1—DOUBLE-CRANK PRESS—HORDERN

For it is our object on these occasions to direct attention to those exhibits which are novel or which demonstrate in what direction further progress may be expected to take place. But the Fair is becoming less and less significant as a guide either to engineering progress or to the capabilities of the engineering trades as a whole. We can but hope that overseas visitors attracted to our shores by the prestige the Fair enjoys will not allow themselves to be deceived by the too comprehensive title of the Birmingham section.

THE MIDLAND SAW AND TOOL COMPANY, LTD.

The woodworking machines on the stand of the Midland Saw and Tool Company, Ltd., Summerlane, Birmingham, 19—there will be twelve machines in all—have mostly been described in connection with other exhibitions; but there is novelty in two band saws, one of which we illustrate in Fig. 2.

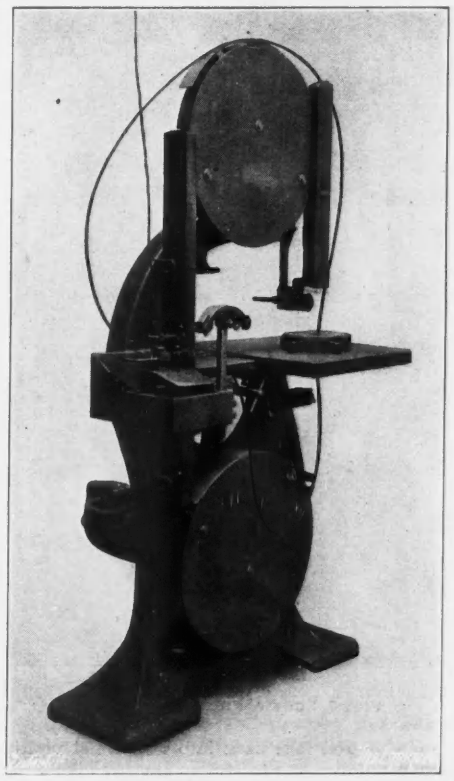

FIG. 2—TOOL-ROOM BAND SAW—MIDLAND

One saw has wheels 36in. in diameter with an integral electric drive running at 1000 r.p.m., and is intended for cutting sheet metal, particularly motor panels. It runs at a speed more than twice the normal wood-cutting speed, and for this reason is provided with several special devices, the chief of which is a dual system of braking on both the top and bottom wheels.

The other steel-cutting band saw is intended for installation in the tool-room for making all kinds of press tools. It has its own motor of 1½ h.p., three-phase, 50 cycles, 200–600 volts, which drives through reducing gears on to the bottom shaft. There is a push-button control contactor starter. The wheels are 22in. in diameter and run at 25 r.p.m. The table measures 20in. by 22in. and can be canted 15 deg. in all directions. The depth of the cut is 9½in. The machine is equipped with a transformer-type brazing attachment, which can be seen on the left of the illustration, so that the ends of the saw can be brazed together after it has been threaded through a hole in the work piece.

HORDERN, MASON AND EDWARDS, LTD.

The illustration, Fig. 1, depicts a double-crank press designed and constructed by Hordern, Mason and Edwards, Ltd., of Birmingham, which embodies a variable-stroke crankshaft enabling strokes between 1in. and 6in. to be employed. The stroke can be altered in a matter of a few minutes to meet the conditions of the work in hand, so that a long stroke can be employed for raising or forming, &c., whilst a change to a short stroke is quickly effected for blanking and piercing operations. This adjustment enables the machine to work under the most advantageous conditions, and possesses the advantage over fixed-stroke presses in that the latter are able to deal effectively only with work strictly within the range of the fixed stroke. The frame is a rigid semi-steel casting reinforced with shrunk-in heat-treated nickel-chrome steel tension rods. The balanced ram of the press is carried on four adjustable bearing surfaces, and is fitted with double ejectors for extracting raised work. The adjustment of the slide is effected through a synchronised worm adjustment fitted to the steel connecting-rods. All-steel gearing is employed, the bearings carrying the pinion shaft being ring-oiled, lined with phosphor bronze. The machine shown has a distance between the upright sides of 45in., and has 3in. of ram adjustment in relation to the table of the press. A non-repeating clutch is fitted whereby the treadle has to be released by the operator before a second stroke can be made, and to complete his safety an automatic guard is fitted conforming to Home Office regulations. The maximum size hole in the bed is 20in. by 30in., and a bolster plate is fitted for the incorporation of air or oil cushion equipment. Lubrication is by means of high-pressure hand or mechanically operated pumps. The main drive is from line shaft or electric motor. The pressure developed at approximately the bottom of the stroke is 150 tons based on 2in. stroke, and the net weight of the machine is 9 tons.

F. J. EDWARDS, LTD.

A large range of sheet-metal working machinery, including folding machines, power, hand and foot guillotines, universal-type swaging machines, hand and power bending rollers, angle iron rolling machines, and wheeling and raising machines, will be on view on the stand of F. J. Edwards, Ltd., of Euston-road, London, N.W.1. In addition, the firm is showing a range of foot, hand, and power presses of various types, one of which is illustrated in Fig. 3. This is the "Besco" T V O punching press. The machine is designed for bench mounting, but a stand can be supplied, together with separate motor drive. The machine is belt driven and runs

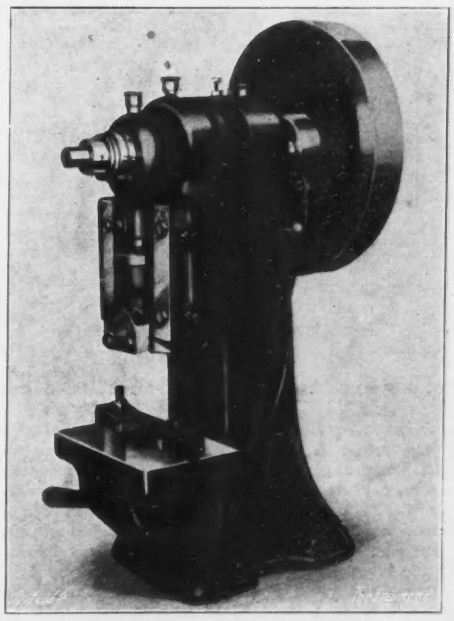

FIG. 3—ADJUSTABLE STROKE PUNCHING PRESS—EDWARDS

at the fly-wheel speed of 150 r.p.m. It provides a maximum pressure of 4 tons and its dimensions are such that ample size of ram and slides has been provided. The depth of throat given from centre to back is 3½in., the maximum distance from bed to ram is 6in., and the table surface is 6½in. by 9in. A clear hole 2in. by 3½in. is provided through the table, and the tool hole in the ram is 1in. diameter

by 1½in. depth. The machine requires ½ h.p. to drive, and the fly-wheel is 13¾in. diameter by 2in. width. The net weight of the press is 275 lb. One of the interesting features of the machine is the fact that the stroke of the ram is adjustable. As can be seen in Fig. 3, the ram is operated by a crank and is retained on the crankshaft by means of lock nuts. Interposed between the ram bearing and the crank is an excentric sleeve which rests on the crank and is held in any position by a serrated face which meshes with the serrated face of the retaining ring. By slacking off the lock nuts and sliding the retaining ring outwards, the excentric ring can be rotated on the crankshaft and locked in its new position, when the retaining ring is replaced. The stroke of the press can be varied by this means from a maximum made up by the stroke of the crank plus the maximum amount of excentricity, to a minimum of the stroke of the crank minus the maximum amount of excentricity. The setting can be varied by any amount between these limits, and

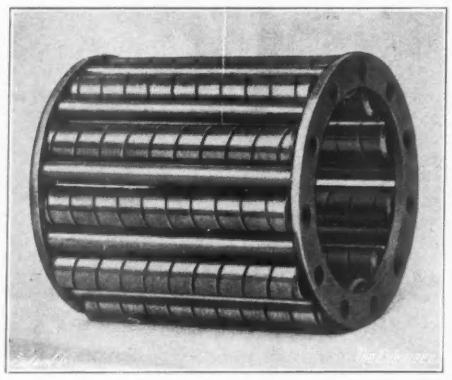

FIG. 4—ROLLER BEARING WITH PULLEYS—SALTER

is positively locked in position when the nuts are home on the shaft. The actual variation of stroke provided is between ¼in. and 1in. The operation of the machine is controlled by a hand clutch lever placed immediately below the table.

GEORGE SALTER AND CO., LTD.

Many of the articles on the stand of George Salter and Co., Ltd., West Bromwich, such as springs, weighing machines, and so forth, are familiar to our readers, but this year a special display is to be made of roller bearings, two types of which are illustrated by Figs. 4 and 5. They range in inside diameter from ⅝in. up to 2ft. 2in., and may have either flexible or solid rollers. The races may be split with a V cut as shown, or may be solid. Bearings are sometimes supplied with flexible rollers held in position by pulleys—Fig. 4. There is also to be on this stand a safe load indicator for jib cranes, which indicates if an attempt is made to luff a load out beyond the safe radius. The warning given consists of a green pilot light which lights up and shows that the indicator is in

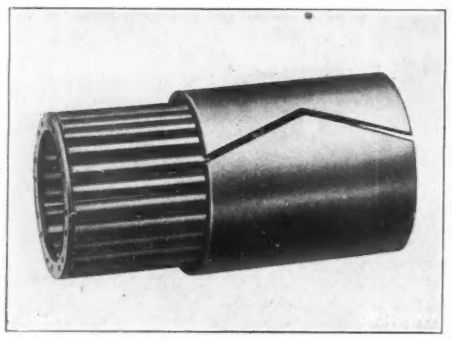

FIG. 5—ROLLER BEARING AND SPLIT RACE—SALTER

working order as soon as the power is switched on to the crane, a red light replaces the green pilot light when the maximum safe load is approached and an electrically operated hooter sounds when the safe load is exceeded. These lamps and hooter are placed in the driver's cab so that he can see and hear them easily. On cranes other than those operated by electricity, the warnings are operated by a dry battery, the green pilot light being dispensed with, but a bell push is fitted to the indicator board to test the battery, red lamp, and hooter. The load on the end of the hauling rope is recorded from the deflection of this rope by means of a spring, the amount of extension of the spring being conveyed to a central rotating armature in the switch box. The angle on which this particular load is being lifted is conveyed to the outer casing of this switch. This outer casing is rotated by a cam operated from a trolley arm which is controlled by the angle at which the hauling rope leaves the masthead sheave. This indicator has been approved by the Home Office. The display will include a number of testing machines, an egg-grading machine with an accuracy of $^{1}/_{64}$ oz., and a capacity of 3600 eggs an hour, and an assortment of ironmongery.

GREENWOOD AND BATLEY, LTD.

The firm of Greenwood and Batley, Ltd., of Albion Works, Leeds, is to provide a larger display this year of hot and cold forging machines, presses, and screw-cutting machines. In Fig. 6 we illustrate one of the power percussion screw presses made by the firm especially suitable for the production of pressings and for embossing work requiring heavy concentrated pressure. The presses have cast iron frames except in the larger sizes, where cast steel is used, and cast steel slides with adjustable guide strips for accurate setting are fitted. The screws are forged steel. An interesting feature of the presses is the automatic spring-reversing stop, which gives extremely sensitive control, and by slight adjustment of the spring stops the machine can be set to run continuously with automatic reverse at any desired part of the stroke, and consequently the intensity of the blow regulated as required. In addition they can be operated by hand, in which case the movements of the slide respond rapidly to the pressure applied to the hand lever, the slide, of course, returning to the top position when the lever is released. Another useful addition is the patent ejector. This is a power attachment combined with a treadle-operated mechanism, which provides for the article formed in the die to be extracted at any required position of the upward travel of the slide, and immediately the stamping has been removed

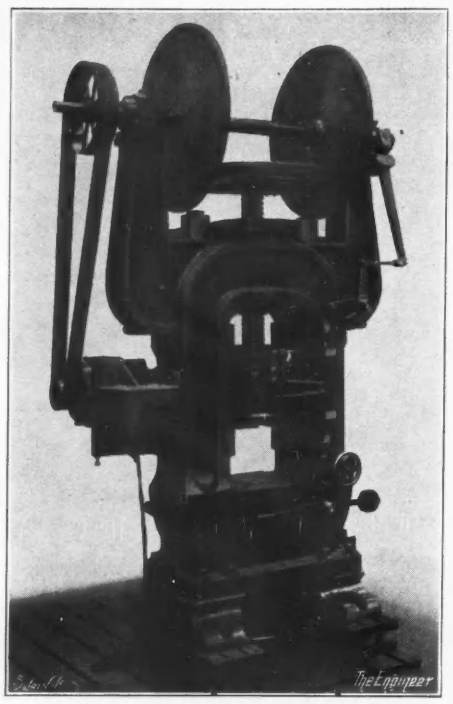

FIG. 6—SCREW PRESS—GREENWOOD

the ejector rod falls back into its normal position, leaving the dies free to receive another blank. The vertical distance through which the ejector rod is required to operate may be adjusted to give the required lift.

IMPERIAL CHEMICAL INDUSTRIES, LTD.

The firm of I.C.I. (Metals), Ltd., Millbank, S.W.1, has recently acquired the manufacturing rights of "Everdur," a copper-manganese-silicon alloy which has met with great success in the United States of America, and the alloy will be shown for the first time at the Fair. It is non-corrosive and almost as strong as steel. The display will show the different forms in which it is sold. The main products of I.C.I. Metals are sheet, strip, rods, tubes, plates, and wire. Hot-rolled sheet will be shown and cold-rolled material, such as is supplied for the general pressings and small ware trade. Rod of all kinds—hot stamping, free turning, &c.—is made for light and heavy general engineering purposes, and certain shapes are finding increasingly important applications in architecture. Tubes range from 15½in. diameter down to the smallest copper piping used for oil and petrol feeding. Condenser tubes of all kinds will be shown, including cupro-nickel tubes, as supplied to the "Queen Mary"; housing tubes in copper; boiler tubes and pipes, &c. There will also be wire of all qualities and in all alloys, including copper wire for electrical purposes and rivet making, brass wire for rivets, pins, screws, heading, &c. Massive copper fire-box plates, as supplied to the "Silver Link," "Royal Scot," and other locomotives, will form another exhibit, and a display of Kunial copper and brass alloys in various forms will include interesting tools in Kunial brass possessing non-sparking qualities and harder than those usually made in non-ferrous alloys. There will be a demonstration of the assembly of the patented "Broduit" copper conduit system, which embodies pressed copper fittings, showing the ease of jointing associated with this system.

THE RHEOSTATIC COMPANY, LTD.

"Satchwell" thermostats and automatic temperature control apparatus will constitute the exhibits of the Rheostatic Company, Ltd., Slough. The tendency towards increased loading in the smaller sizes of water heaters and the possibility of increased temperature differences between the water at the top and bottom has made the use of a stem type thermostat desirable to permit control as a function of the mean water temperature. The "Satchwell" type Y thermostat, Fig. 7, has been produced to meet this need. In general design the latest type is similar to previous "Satchwell" immersion thermostats and incorporates the patented short-break switch. The head of the instrument is concentric with the stem, and in view of space restrictions in small water heaters

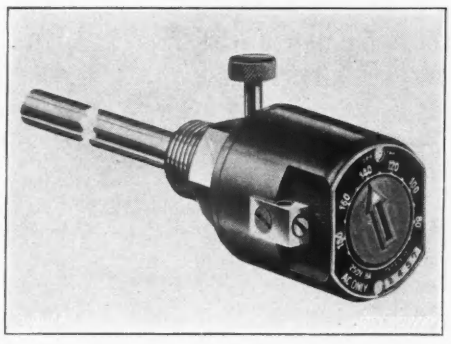

FIG. 7—"SATCHWELL" IMMERSION THERMOSTAT —RHEOSTATIC

the dimensions have been reduced to the lowest possible values. Alteration of temperature setting can be quickly and accurately made. The moulded dust-tight cover which encloses the mechanism has flats on each side and carries substantial pinching screw terminals. The thermostat is supplied complete with the pocket, which is screwed ½in. gas. Thermostats are supplied with stems of three alternative lengths and can be used for the control of water heaters with loadings up to 1600 watts at 200/250 volts.

The "Satchwell" room thermostat, Fig. 8, is suitable for the control of electric space heating installations, coal or oil burners, or for zone control of central heating in conjunction with motorised

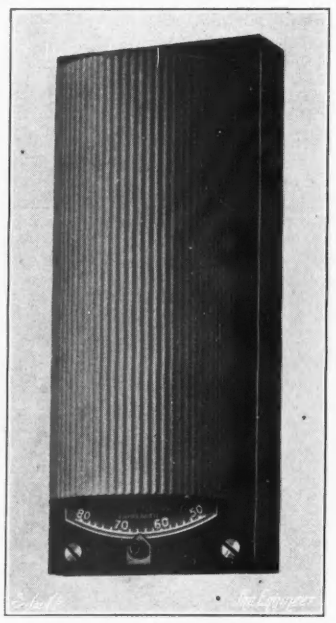

FIG. 8—"SATCHWELL" ROOM THERMOSTAT —RHEOSTATIC

valves. It is claimed that, owing to the absence of pivots or other possible points of wear, adjustments and calibration do not alter after a long period of use and great reliability is ensured. A lever for adjusting the temperature setting is brought out at the base of the cover and works over a widely calibrated temperature scale. A simple locking device can be used to prevent unauthorised alteration. Although the standard temperature range is 50/80 deg. Fah., other ranges can be provided when necessary. A temperature change of ½ deg. Fah. above or below the set temperature causes the thermostat to respond, and owing to its thermal characteristics it follows relatively rapid changes in room temperature. Even in mild weather, when the capacity of the heating plant is greatly in excess of requirements, control is given within fine limits. Thermostats are supplied for 0/5 ampères or 5/15 ampères up to 250 volts.

THE ENGLISH ELECTRIC COMPANY, LTD.

Domestic electrical appliances, such as cookers, fires, and water heaters, will be shown by the English Electric Company, of Stafford. The company is also exhibiting the single-operator A.C. welding equipment (Fig. 9). Its efficiency is claimed to be approximately 90 per cent. Without any additional protection the equipment may be used outdoors with a degree of reliability equal to that of oil-immersed power transformers. Apart from the simplicity and high efficiency of these equipments, the saving in initial cost compared with that of an equivalent D.C. equipment is said to be approximately 60 per cent.

Other English Electric exhibits of interest to engineers will be examples of the company's fuse gear.

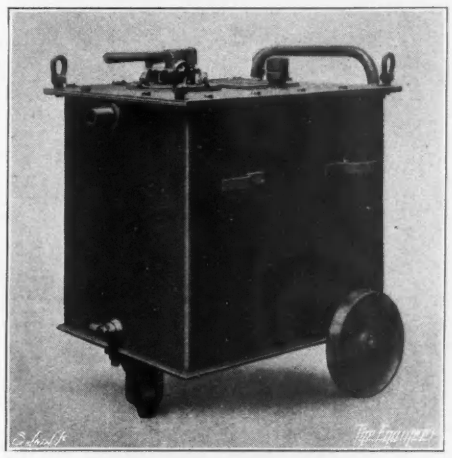

FIG. 9—SINGLE-OPERATOR A.C. WELDING EQUIPMENT—ENGLISH ELECTRIC

All this apparatus is ancillary to the high rupturing capacity, non-deteriorating cartridge fuse. Among the new equipments on view will be the Humburton metal-clad bus-bar system for factory distribution, and a new fuse fitting for pole mounting and ground operation. The former consists of a metal-clad, low-tension bus-bar system provided at short intervals with plug sockets, which enables fuse-boxes carrying plug pins to be connected to the bus-bars whilst they are alive, adequate provision being made for earthing. The system is particularly suitable for machine shops in which points are required at close intervals. The low-tension fuse fitting incorporates the English Electric high rupturing capacity fuse which eliminates overheating and deterioration.

THE BRITISH THOMSON-HOUSTON COMPANY.

In addition to a display of "Mazda" lamps on ts own stand, the British Thomson-Houston Company, Ltd., will have exhibits on the stand of the Birmingham Corporation. These include a glass bulb mercury pool rectifier and a Thyratron welder equipment. Both are to be shown in operation and are isolated

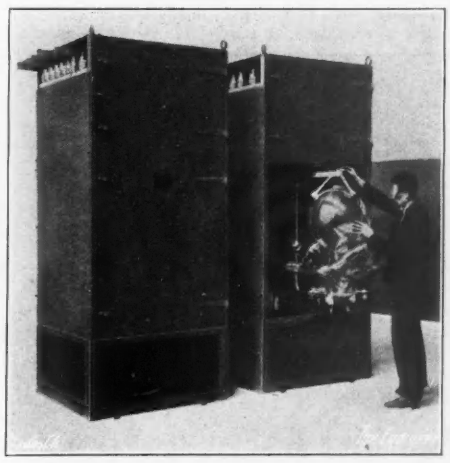

FIG. 10—GLASS BULB MERCURY POOL RECTIFIER —B.T.H.

from the supply mains and protected against overloads by a B.T.H. pedestal switch. Apart from high efficiency, the glass bulb mercury pool rectifier presents the advantages of simple control, silence and freedom from vibration, ease of erection, practically no maintenance, no special foundations, and small floor space.

The equipment shown in Fig. 10, represents the largest of a range of rectifiers rated at 150, 250, and 400 ampères. It has six anodes and is suitable for ratings of 400 ampères at 600 volts or 150 ampères at 3000 volts. For demonstration purposes a small transformer with six-phase double-star and interphase connections is provided to give an output of 150 ampères at 230 volts. On closing the transformer supply switch the ignition unit automatically energises the excitation circuit and the bulb is at once ready for load.

The B.T.H. Thyratron control unit for electric welding should now be familiar to most engineers associated with electric resistance welding work. It is claimed to permit the welding of special alloys, coated steel, and fine-gauge materials, believed at one time to be beyond the scope of the process. With its aid the production speed of welding mild steel can also be increased. These Thyratron equipments are supplied for controlling the heaviest kVA demands met with in resistance seam or spot welding and the welding current can be made and broken up to 1500 times per minute with the highest precision. In connection with spot welding, the Thyratron timer can be used to control the duration of the weld to within very fine limits. The equipment is particularly adaptable to the spot welding of mild steel and certain alloys, involving speeds of welding not exceeding, say, 150 welds per minute, but demanding considerable heat intensity for a short period for the actual welding process. The equipment can be adjusted to give a welding time of about one-tenth second and once set by the operator it remains constant.

M. AND C. SWITCHGEAR, LTD.

Examples of metal-clad oil-break switchgear will be exhibited by M. and C. Switchgear, Ltd., of Kelvinside Works, Kirkintilloch, Glasgow. The oil circuit breaker shown in Fig. 11 has been designed to meet the demand for a small capacity unit. The approximate overall dimensions are 10½in. by 9⅜in. by 7⅛in. It may be used for distribution service or for starting squirrel-cage motors in accordance with the "straight on" method provided the standstill current does not exceed 100 ampères. The maximum horse-powers

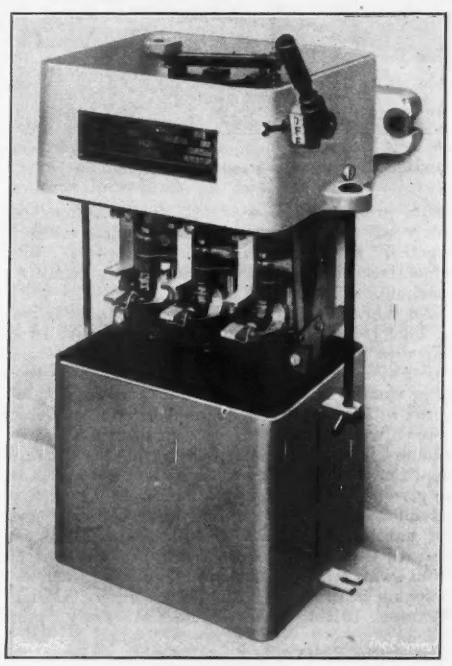

FIG. 11—METAL-CLAD OIL CIRCUIT BREAKER —M. AND C. SWITCHGEAR

and voltages for which the switch is suitable are 5 h.p., 220 volts; 10 h.p., 440 volts; and 15 h.p., 660 volts. The construction complies with British Standard Specification No. 116, and is standardised in the 30-ampère size for wall mounting, as illustrated. Total enclosure prevents unauthorised interference with the automatic trips and affords complete protection against all deleterious atmospheres. Both the fixed and moving contacts are removable. The latter are of the contactor type, and give in operation a true rolling action. The moving contact arms are composed of pressed bar channel section, and enclose the steel pressure springs which control the heavy contact tips. Both the coils and plungers of the overcurrent trips, which act directly on the trip bar, are oil-immersed, and the trip settings extend to the limits specified in B.S.S. No. 116. Time lags of the inverse ratio type are provided as a standard fitting and when required for starting service they are of the double lag type. The under-voltage release has a laminated iron circuit with shading rings to eliminate hum, and operates within the limits imposed by B.S.S. No. 116. Constructed of mild steel, the operating mechanism is of the loose handle, quick break type. As shown in Fig. 11, the operating handle is at the side of the breaker, and no trip knob is required. Push-button contactor gear exhibited includes straight-on starters, star-delta, and stator-rotor starters, and latched in contactor gear with push buttons. The 50 h.p., 440-volt stator-rotor starter, Fig. 12, complies with the Buxton requirements.

Starter pillars of this kind are designed for starting slip-ring motors of the three and two-phase types. They are made in two sizes, No. 1 size is for 25, 50, and 65 h.p., at 220, 440, and 600 volts respectively, and No. 2 size for 50, 100, and 125 h.p., at the same respective voltages. The electrical equipment of No. 1 pillar consists of a T.P. stator contactor, two D.P. rotor contactors, two timing devices, three thermal overcurrent trips, three short-circuit protection fuses, and one T.P. isolating switch. No. 2 pillar is devoid of the short-circuit protection fuses. Special rotor contactors are supplied to deal with rotor currents exceeding 100 ampères in the case of No. 1 starter and 200 ampères in the case of No. 2 starter. Timing devices are actuated by the contactors which upon closing release a spring-loaded centre-hinged arm, to which is coupled an oil lag restraining plunger. The resistances are of the rigid, unbreakable, non-rusting, grid type, rated in accordance with B.S.S. No. 587. While in the No. 1 starter the over-current trips are

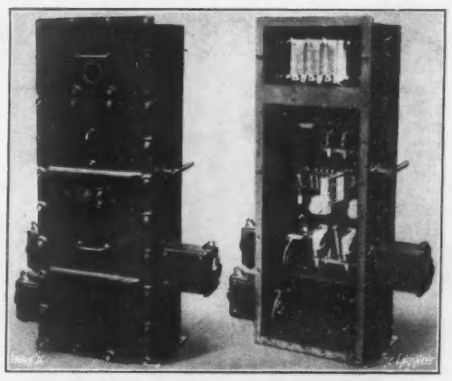

FIG. 12—SLIP-RING MOTOR STARTER —M. AND C. SWITCHGEAR

of the adjustable thermal hand re-set type, those in the larger starter are of the magnetic solenoid type, with adjustable inverse ratio oil time lags. Under voltage protection is inherent in all the contactors. The "start" and "stop" push buttons are shrouded and mounted on the front of the pillar, as shown, and terminals are provided for connections to remote start and stop buttons. Besides the flame-proof type of enclosure hose-proof and factory enclosures are provided, according to requirements.

BRITISH SANGAMO COMPANY, LTD.

Interesting exhibits of the British Sangamo Company, Ltd., of Cambridge Arterial-road, Enfield, Middlesex, will be the Sangamo "Model B" multi-coin prepayment meter, and an example of this meter, with a variable rate fixed charge collector. The B model meter (Fig. 13) supersedes the first Sangamo multi-coin prepayment meter introduced some three years ago, and incorporates modifications based on the practical experience gained during that time. Features

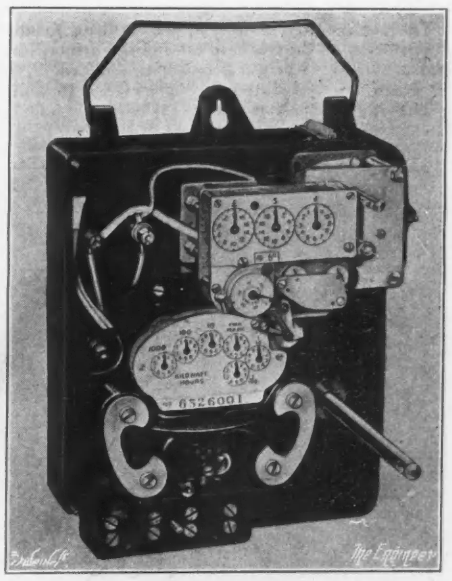

FIG. 13—THREE-COIN PREPAYMENT METER —SANGAMO

of the new meter are as follows:—(1) The prepayment mechanism accepts shillings, sixpences, and pennies in the same slot and is operated by a simple turn of the operating handle, the "push-in" method of operation necessary to caliper the coin in the former model having been eliminated. (2) The mechanism will operate with any bent coin of correct denomination, but incorrect coins may be released into the coin box. (3) When the mechanism is free from coins the operating handle is always automatically returned to the coin-insertion position. (4) By means of a pawl and ratchet combination, the operating handle is prevented from being turned in the incorrect position before or after the cycle has been begun, and completion of the operation

is indicated by a bell. (5) The operating shaft carries a coin barrel of moulded Bakelite, and during the cycle turns through 360 deg., thus preventing the insertion of coins attached to a string or wire ; upon the insertion of a coin an insulated guard is thrown across the slot and is locked in position until the operation is completed. (6) The instrument case and base are composed of bakelite, and the coin mechanism is provided with a bakelite covering to avoid any possibility of the consumer receiving a shock when inserting a coin. The outstanding features of the variable rate fixed charge collector or unit, which can be fitted to this new meter, are : (1) The collector is fitted with a resetting knob of insulating material

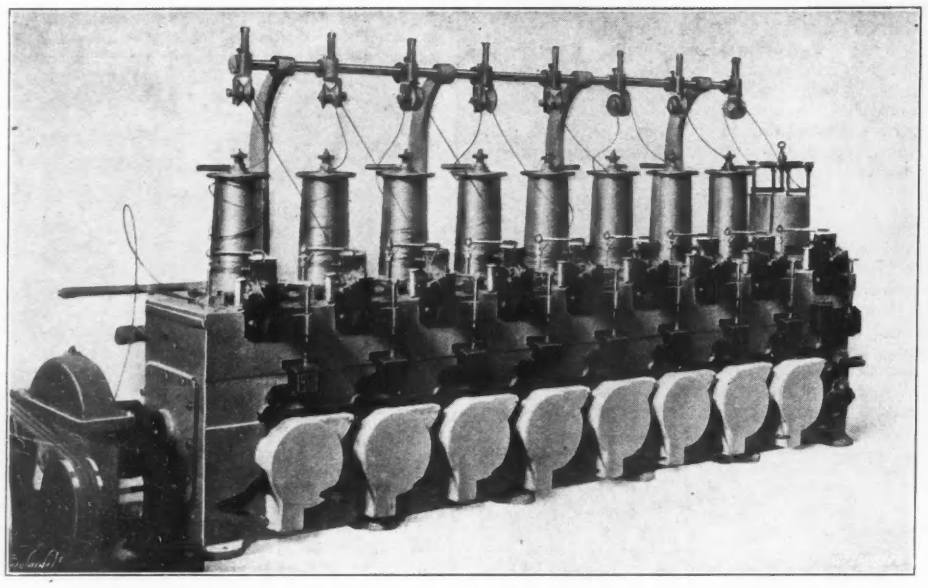

FIG. 14—NINE-HOLE CONTINUOUS WIRE-DRAWING MACHINE—FARMER NORTON

which ensures that when a screw driver is inserted to rotate the knob which operates a " shilling-per-week " dial, there is no possibility of it being made " alive." (2) Access to the resetting knob is gained by the removal of a stout moulded bakelite plug which is locked with the coin box ; alternatively, if it is required to separate the locking of the two, the plug may be sealed by a wire. (3) Collectors are supplied to collect from ½d. to 1s. 10½d. per week in ½d. steps, 1d. to 3s. 9d. per week in 1d. steps, and 2d. to 7s. 6d. per week in 2d. steps. The standard models of both the ordinary and fixed charge collector meters are of the three-coin pattern, but the meters can be supplied both as single and double-coin types.

SIR JAMES FARMER NORTON AND CO., LTD.

There are to be a number of wire-drawing machines in operation on the stand of Sir James Farmer Norton and Co., Ltd., Adelphi Ironworks, Salford, 3, four of which are illustrated by Figs. 14, 15, 16, and 17.

The first of these (see Fig. 14) is a nine-hole continuous wire-drawing machine for drawing on the non-slip principle carbon steel wire from 12's gauge to 21's finishing gauge. It is provided with water-cooled blocks and water-cooled die holders, and is driven by an electric motor through a four-speed gear-box. Individual clutches of the coil type are provided for each block. In the event of the wire breaking on any particular block, all the preceding blocks are automatically stopped by means of a patented electric arrangement through a plunger and special trip switch mechanism. Although the preceding blocks are automatically stopped, the other blocks towards the finishing end continue to run and finish off the length of wire, so that the broken end can be rethreaded. The wire is drawn through the dies by means of specially designed tongs, which are attached to the drawing block. The clutches which actuate the pull are very gentle in action and avoid any snatch on the wire when pulling in. The die-boxes are water cooled and enable the wire to be cast conveniently on to the block. The driving shaft and gearing of the machine are contained in a totally enclosed chamber, are provided with roller and ball bearings throughout, and are run in oil, which is fed under pressure from a pump. This machine offers many advantages, especially where wires are welded together, in accordance with the general practice, which ensures a considerably increased output of the machine.

An under-liquor wire-drawing machine is shown in Fig. 15. This machine is provided with twenty-one dies for drawing copper wire from 20's gauge to 42's finishing gauge. In general construction it is similar to the machine just described. It is fitted with an electric spooling device for spooling the copper wire. This device ensures that the wire is wound with even tension on the bobbin throughout the depth of the coil. The tension can also be regulated to give a tight or slack coil, as required, which is an advantage where the bobbins full of wire are required for subsequent annealing. A special arrangement ensures that the mouths of the dies are kept clean from swarf when the machine is drawing wire. The machine is driven by an electric motor through a Texrope drive, with a special relay system,

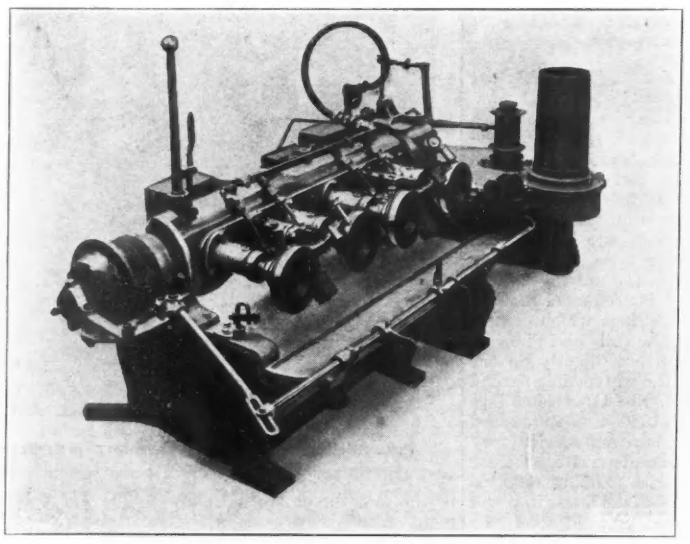

FIG. 15—DIE WIRE-DRAWING MACHINE—FARMER NORTON

giving a slow speed for threading and running speed.

The machine shown in Fig. 16 is of the under liquor type for drawing carbon steel or mild steel, and is provided with eleven dies taking carbon steel wire from 20's gauge to 30's finishing gauge. The drawing is done underneath the liquor, in such a manner that the dies are kept clean from foreign matter, and their life is thus considerably increased. The machine is so arranged that when it is to be strung up the whole head can be rotated through 90 deg., and the dies brought up out of the liquor, so that they are readily accessible. The wire is strung up on the machine, whilst the cones are in the horizontal position. Afterwards the drawing cones and dies are swung down into the vertical position and become entirely immersed in the liquor tank, in which position the wire is drawn. The turbulence of the drawing liquor keeps the dies and cones cool. The machine is provided with ball and roller bearings throughout, and the gearing runs in oil in a totally enclosed gear-box. The motor for driving the machine is mounted directly on top of the gear-box. The machine may, however, be provided with a belt pulley drive where required. The wires are usually welded

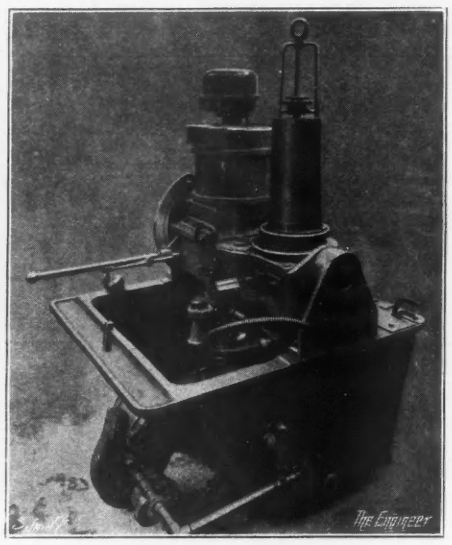

FIG. 16—UNDER-LIQUOR WIRE-DRAWING MACHINE—FARMER NORTON

together to give continuous runs. In practice one attendant operates four machines.

The high-speed fine wire-drawing machine shown in Fig. 17 will draw wire from 36's to 47's gauge, and has eighteen dies. No idle cones are used and consequently the usual overhang of the cone is greatly reduced. It is provided with an electric spooling device, similar in construction to that just described, and has traversing die holders. A constant traverse of the wire across the face of the cones is provided. An important feature of the machine is the traverse of the spooling gear, which is in a straight line and ensures an even lay on the spool. The machine is mounted on ball and roller bearings throughout. The drawing speed is up to 5000ft. per minute, according to the quality of the wire.

In addition, there will be shown a bar and tube straightening machine, which will straighten bars within the requisite limits for centreless grinding. These machines are being used very successfully for straightening high-tensile steel bars, steel tubes and non-ferrous bars and tubes. All end kinks are taken out and the bars straightened within the requisite degree of accuracy for centreless grinding. From long experience the makers have come to the conclusion that the only way to obtain such results is by being able to adjust and set the angle of the rolls to suit the various diameters of stock, according to the nature of the material. This adjustment and the particular shape of the rolls enables full-line contact to be obtained on the bar or tube instead of three-point contact only, as in the ordinary bar-straightening machine. Another machine to be exhibited is a rotary

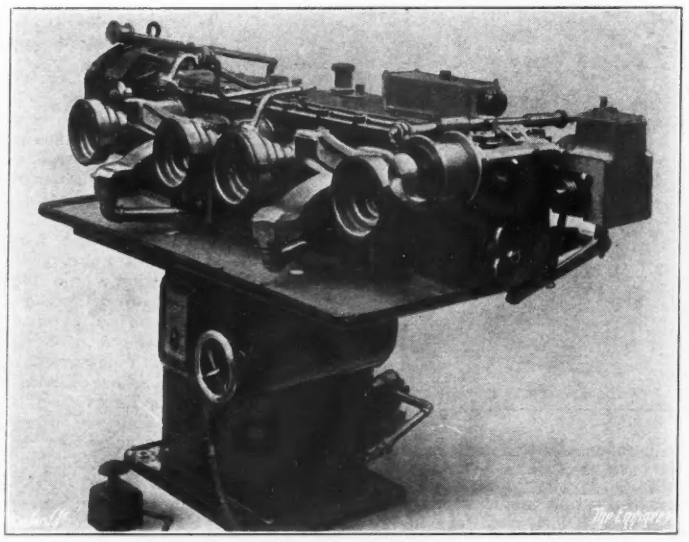

FIG. 17—HIGH-SPEED WIRE-DRAWING MACHINE—FARMER NORTON

cold swaging machine, mounted on roller bearings, suitable for swaging all classes of rods or tubes within the limits of the machine. The machine will be demonstrated at work. Messrs. Farmer's subsidiary company, Wire Drawing Dies (Manchester), Ltd., will show a range of diamond and synthetic dies for drawing all classes of wire and tubes.

SERCK RADIATORS, LTD.

Besides a representative display of the oil coolers, air blast apparatus, radiators, &c., for cooling purposes on power plants, transformers, rectifiers, &c., in which Serck Radiators, Ltd., Birmingham, have specialised for a number of years, the firm is to make a feature this year of the "Serckulator," which is illustrated in Fig. 18. This unit was developed in conjunction with the Industrial Heating Section of the City of Birmingham Gas Department. It is designed to give a uniform heating of ovens by the rapid recirculation of hot air. The heating unit is gas-fired and the air is circulated by a suitable blade fan and distributed by carefully designed ducting. The materials used for the construction are chosen according to the temperature desired. The fan is direct motor-driven, and the bearings are oil cooled and lubricated by pump circulation from a tank below. The complete unit, suitably insulated to conserve heat, is fitted with thermostatic control gear, and also a gas-control valve arranged to operate in the event of a motor stoppage. The heaters are supplied if desired with temperature indicators or recorders. Different types are made for air temperatures up to 600 deg. Cent. in varying sizes, with a maximum gas consumption of 1200 cubic feet per hour, and are in use for all kinds of drying, stove enamelling, "blueing," tempering such articles as springs, pen-nibs, &c., and for the heat treatment of aluminium alloys.

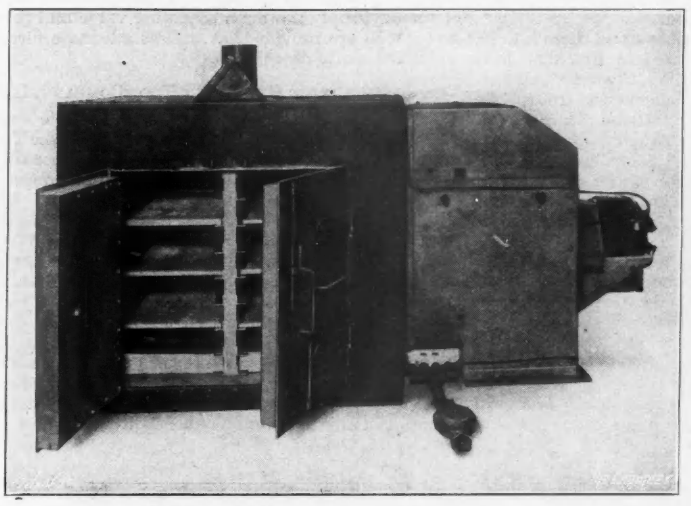

FIG. 18—"SERCKULATOR" GAS OVEN—SERCK

PRIOR BURNERS, LTD.

A practical demonstration of the Prior "Mastoker" automatic coal stoker, which we illustrate in Fig. 20, is to be arranged on the stand of Prior Burners, Ltd., of 2, Brandon-road, London, N.7. The burner is to be used for firing a Ruston-Hornsby vertical steam boiler fitted with a Hayward-Tyler duplex feed pump controlled by a Ronald Trist automatic water feed. The Prior "Mastoker" is an electrically operated and controlled, screw feed, multi-speed, underfeed stoker. A silent worm and wheel reduction gear, combined with pawl and ratchet final drive, provides five speeds and neutral. A hardened and ground worm, manufactured by David Brown and Sons, Ltd., of Huddersfield, with a phosphor bronze worm wheel, is mounted on a cast iron centre and is rotatable, providing three different wearing positions. The pawl is drop forged. The Prior special double dog shearing pin device enables a broken pin to be replaced in a few seconds without tools. Oil bath lubrication is provided to all moving parts of the gear-box. Bronze bushes or double-row angular contact ball bearings are used where appropriate. All components are jig drilled and machined and strictly interchangeable. The coal feed worm is made of special alloy iron of high nickel content. It affords great resistance to heat and wear, combined with considerable strength and rigidity. The coal feed tube is a solid drawn wrought iron tube. Spigot flanges are provided between hopper and boiler to facilitate the removal of the coal worm in a confined space. The hopper base is made of rust-resisting "Armco" iron sheet. The forward end of the hopper base is provided with a semi-steel crusher block, which can be quickly withdrawn to enable an obstruction to be removed from the coal worm. Emptying doors are fitted on both sides of the hopper for accessibility. Agitators can be supplied where it is desired to burn wet "smalls." They assist feeding, but are not recommended with dry coals as they are unnecessary and absorb power uselessly. When desired, hoppers and extensions are available of heavy gauge "Armco" iron sheet, stiffened with steel flanges and specially designed for regular feeding and easy access to the boiler doors and for high capacity with a low loading line. A choice of open or closed hoppers in various sizes, but on a uniform base, is given, the closed hoppers being fitted with gas-tight pressed steel covers. The motor cover and belt guards are of heavy gauge "Armco" iron sheet, secured by winged nuts. The burners are of heavy-section, high-grade refractory iron; on the larger models the tuyeres are sectioned to take care of expansion strains, and ports of venturi form prevent ash and coal dust from falling into the air chamber. A rectangular clean-out is fitted to the air chamber on all models. Ample capacity makes frequent cleaning of the burners unnecessary. Alternative designs are available for different boiler types. Dead plates are provided made of high-grade refractory iron and specially shaped to facilitate removal of clinker and to prevent warping. A silent centrifugal fan, accurately balanced, is mounted on an extension of the gear-box spindle, and runs at a low speed from 1150 to 1750 r.p.m. The fan housing is fitted with an inlet of conical form and a cast aluminium damper disc, which gives accurate control of the air volume. A neat flanged outlet leads to the air duct. A blast gate in this duct controls the fan pressure, preventing fly ash or local overheating of the boiler owing to intense flame. A small supply of air under high pressure is tapped off the air duct and forced into the front end of the worm tube. This arrangement, it is claimed, completely eliminates smoking back through the hopper. A "V" rubber belt drive is fitted from the motor to the gear-box. The larger models are provided with two-speed pulleys, enabling the fan speed and coal feed to be varied in the proportion of 6 to 5, thus affording a total of ten speeds in conjunction with the five-speed gear-box.

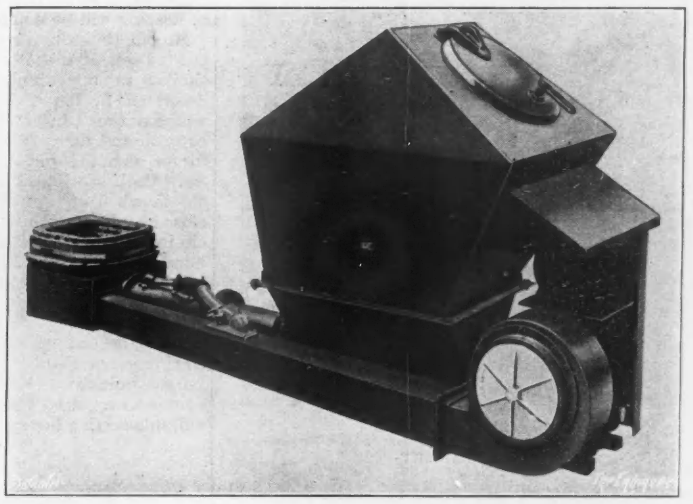

FIG. 20—"MASTOKER" AUTOMATIC STOKER—PRIOR

AVELING-BARFORD, LTD.

On the outdoor stand of Aveling-Barford, Ltd., of Grantham, and Aldwych House, London, will be shown a display of modern road and path rollers. The largest exhibit is the 7-ton oil-engine-driven road roller, which is one of the largest machines in the firm's D X series, comprising rollers built with weights of 5, 6, 7, and 8 tons. The example on view is illustrated in Fig. 19 herewith, and it is complete with differential gear, awning and curtains, and carries a Price single-tine scarifier, also a water tank and sprinkling pipes. As will be seen from our engraving, the carriage, which is of welded steel plate construction, embodies a steel head casting, which houses the pivot pin of the steering fork, which, itself, is a steel casting. The pivot turns in a self-adjusting taper bearing, and steering is effected by a hand wheel through a horizontal shaft with a worm and segment. The forecarriage is of improved underslung design. Both the front and the rear rolls are built up of steel plate. The front roll has a diameter of 42in. and a width of 34in., while each of the rear rolls is 47in. in diameter with a width of 20in., an arrangement which provides 4in. overlap on each side from front to rear rolls. As shown in Fig. 19, all the rolls are furnished with steel scrapers.

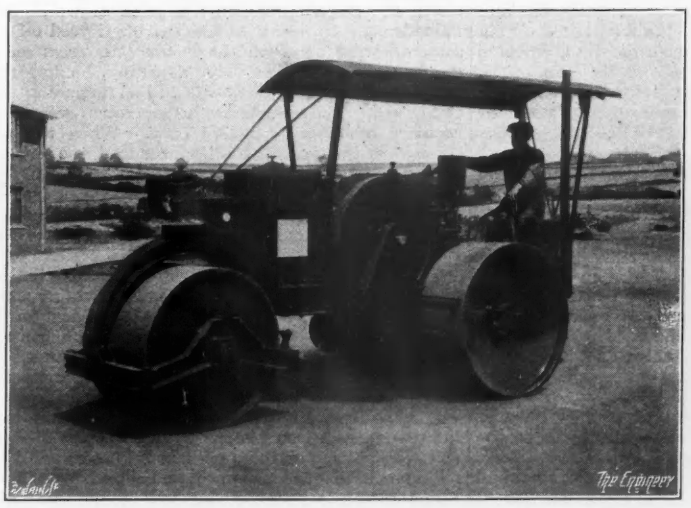

FIG. 19—7 TON OIL ENGINE-DRIVEN ROAD ROLLER—AVELING-BARFORD

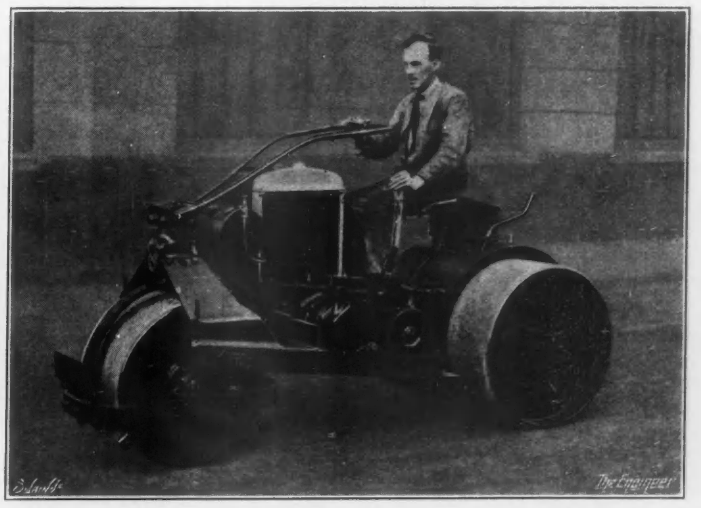

FIG. 21—28-CWT. PETROL ENGINE-DRIVEN LIGHT ROLLER—AVELING-BARFORD

The drive is furnished by a single-cylinder Aveling oil engine working on the four-stroke, single-acting principle, with a designed output of from 17 to 19 b.h.p. at a speed of 500 r.p.m. The three-speed gear-box runs in an oil bath and has roller bearings and wide steel gears, the final drive being by a steel pinion to a cast steel gear wheel on the back axle.

There are two clutches, one for the forward and one for the reverse movement, which are mounted at the forward end of the gear-box and are worked by a single lever. The three speeds in either direction are 3¼, 2½, and 1 m.p.h. The wheel base of the roller is 8ft. 2½in., with a turning circle diameter of 25ft. Two brakes are used, a foot brake of the internal expanding type and a hand brake of the contracting band pattern, which is fitted on the back axle. The fuel tank has a designed capacity of 15 gallons, which is ample for good working periods.

The smaller pathway or light road roller to be shown

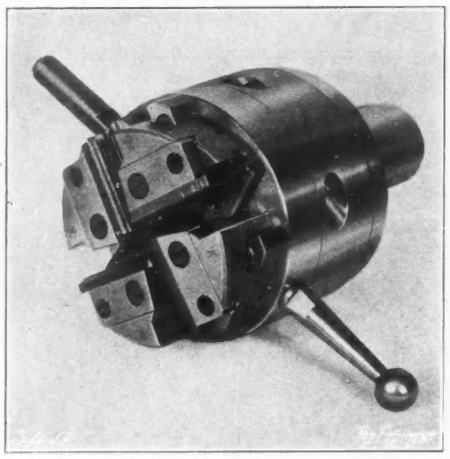

FIG. 22—"TANGEL" STATIONARY DIEHEAD—HERBERT

is the "Y 5" machine, which we illustrate in Fig. 21. It weighs approximately 28 cwt., and has been designed so as to give equal pressure on the front and the rear rolls. The engine is a J.P.V., 11¼ b.h.p., twin-cylinder petrol unit, operating at 1500 r.p.m. There are two speeds, the lower speed being 1·7 and the higher speed 3·6 m.p.h. at normal engine speed, while variations of speed from 1 to 5 m.p.h. can be obtained by throttle control through both gears. The control lever operates two quick reverse clutches, giving forward and backward travel. Steering is direct through a loop-shaped tiller, and two brakes are fitted. The rolls, we may remark, are very large for so small a machine, and differential gear is provided as standard equipment. The third exhibit, which we do not illustrate, is the "Victor" motor-driven hand roller, which has a rolling width of 30in. It has a weight of 15 cwt., and is also supplied in a 12½ cwt. size. The engine is a 3 b.h.p., single-cylinder petrol unit, running at 1500 r.p.m. The rolling speed is 2 miles per hour, and a single reverse is obtained by moving the control lever backward or forward.

ALFRED HERBERT, LTD.

Two stands are to be used to show the products of Alfred Herbert, Ltd., of Coventry, the one to demon-

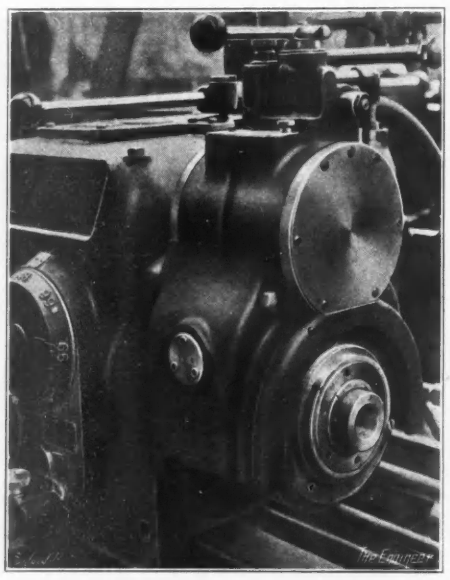

FIG. 23—"DEAD LENGTH" BAR CHUCK—HERBERT

strate the Atritor and the other the firm's range of small tools and accessories.

A No. 6 Atritor, which has a capacity of 500 lb. of coal per hour, will be arranged to fire four small furnaces of a type commonly used for drop forgings and of a size not hitherto considered suitable for pulverised coal firing. The plant is arranged to fire these furnaces by means of the ring main distributing system, which can be used for the firing of a large number of furnaces, up to fourteen or more. The installation consists of a small coal elevator of the Redler type, which feeds the raw coal into an overhead bunker. From this bunker the coal passes into the Atritor which dries and pulverises it and delivers it into a small storage bin holding a few hours' normal requirements. At the base of this bin is fitted a pulverised coal feeder, driven by means of a variable-speed motor, which, in turn, delivers the pulverised coal at a known rate into an air main, and tappings are taken off this main to serve the individual furnaces. These tappings are controlled by means of valves, so that each furnace is under precise control at any time. Any coal dust remaining in the line is returned to the fan for redistribution. The furnaces will be of a type which will normally burn about 40 lb. of coal per hour, and the quality of heating will be demonstrated.

Among the exhibits on the other stand there is to be the "Tangel" diehead illustrated in Fig. 22. It is similar in appearance to the "Tangar" model described in our Fair Supplement for 1934, but whereas the Tangel type is stationary for use on capstan and turret lathes, the Tangar type is rotary, for use on multi-spindle automatics, drilling machines, &c. Both are based on the tangential dies used in the firm's Tangic diehead. The Tangel diehead is closed by hand or by a cam, which rotates the front closing ring. One setting gauge deals with all right-hand dies. A second setting gauge is required for left-hand dies. The setting gauge is adjustable, so that the setting of the dies is always obtained from the first full tooth on the throat, whether the pitch be fine or coarse. Micrometer adjustment of the setting gauge reading to 0·001in. enables the dies to be set quickly and accurately above or below the centre as required for different materials. The most suitable setting having once been determined, can be repeated at any period. Both dieheads are provided with setting graduations for British, U.S.S., and metric pipe threads. The graduations are marked in separate sections on the back of the diehead, and also on the adjustable ring at the front. To obtain a ¾in. pipe thread, the ¾in. mark on the adjustable ring must be in line with the zero on the back of the diehead. The ⅝in. Tangel and Tangar dieheads will cut all Whitworth, U.S.S. standard, and standard metric threads, and also a number of fine pitch threads within their capacity, with one set of dieholders. Pipe threads and special pitch threads require special dieholders, however.

Another interesting accessory is the "dead length" bar chuck, illustrated in Fig. 23. It is operated by compressed air and, as in the hand-operated bar chuck made by the same firm, the collet or jaws are stationary, closing being effected by end movement of a sleeve. The work is therefore kept stationary during chucking and no end movement occurs. As the closing mechanism is external it does not reduce the capacity of the spindle bore. Power is supplied by an air-operated piston to a lever which moves a sleeve endwise along the chuck. The phosphor bronze gluts which are bolted to the body of the chuck fit into two helical grooves cut in this sleeve. It follows therefore that the sleeve is moved round and along the chuck. The lengthwise movement is transmitted to a ball-operating sleeve, within the first sleeve, by means of a phosphor bronze thrust washer at the "opening" end and a ball thrust washer at the "closing" end. As the ball-operating sleeve moves it brings a smaller diameter over the operating balls, its two diameters being linked by a cam surface. The thrust thus transmitted to the operating balls moves the collet sleeve over the conical portion of the collet or jaws, and thus grips the work. A reversal of this motion effects the opening of the jaws, the chuck being induced to open by spring action. The collet butts against a screwed cap which is adjustable to accommodate slight variations in the diameters of the work being held. The correct adjustment can be easily "seen" by an operator. The collet or jaws can be removed by removal of this cap. Only at one point do the revolving parts of the spindle make contact with the stationary body, and there the two thrust washers provide ample bearing. A hand valve controls the action of the chuck. The air used is filtered, and an oiler is provided for the pneumatic mechanism. A centre plug is provided for draining. In Fig. 24 the Herbert monobloc air control is shown. This control system used with the air chuck just described provides a neat and efficient system, by which the operation of the machine can be brought to one point without complication of the mechanism. As will be seen, adequate provision has been made for the control of the air supply; a main adjusting valve and pressure gauge are provided, as well as adequate filters, which are easily detachable.

THE CONSOLIDATED PNEUMATIC TOOL COMPANY, LTD.

In Fig. 25 is illustrated the new portable compressor unit made by the Consolidated Pneumatic Tool Company, Ltd., of Egyptian House, 170, Piccadilly, W.1. It is to be exhibited by the firm amongst a range of compressed air tools and equipment. The engine is of the "Ricardo-head" type, a four-cylinder overhead-valve, solid-injection oil engine. While an electric starter can be fitted if required, the engine can be started from cold by hand easily. Starting up is further assisted by the provision of a hand lever operated clutch between the engine and compressor. It is of the spring-loaded, self-adjusting, twin-disc type, and is flexible, thus avoiding trouble owing to faults of alignment. An enclosed centrifugal governor controls the engine speed through the fuel pump. In addition, an unloader is fitted to the com-

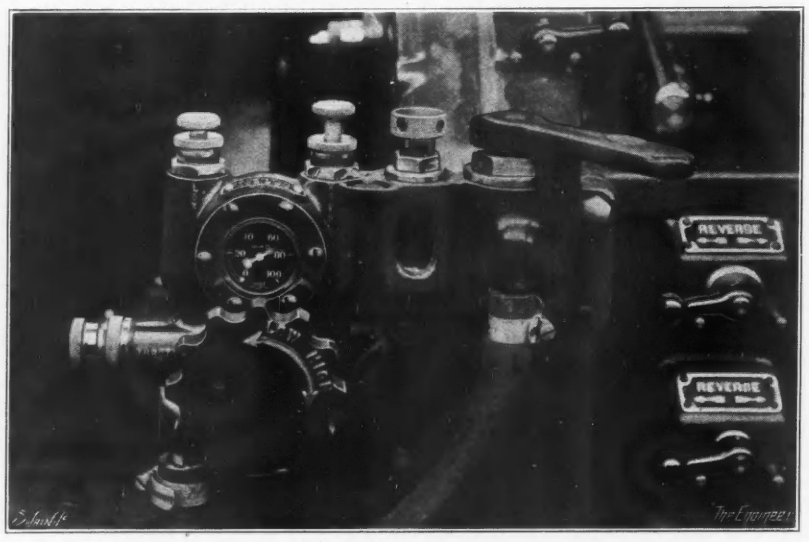

FIG. 24—MONOBLOC AIR CONTROL—HERBERT

pressor which closes the engine throttle by pneumatic pressure, as well as unloading the compressor, by the following method:—When the pressure of the air in the receiver reaches the point at which the unloader is set to operate, the valve is forced off its seat, allowing air from the receiver to press on a diaphragm in the inlet valve assembly, holding the inlet valve discs off their seats and so unloading the compressor. The compressor then operates against the pressure of the atmosphere only. When the air pressure in the receiver has been reduced, the tension of the spring overcomes the pressure of the air in the receiver, and the unloader valve is forced back against its seat on the cap. The air in the pipe escapes to the atmosphere under the valve, the inlet valves are closed and compression is resumed.

The compressor itself is a two-stage, two-cylinder, air-cooled machine, such a design providing simplicity and efficiency. Forced-feed lubrication is fitted, avoiding any "oil pumping" by careful control of the flow. Full floating piston pins are carried in H-section, drop-forged, high-tensile steel connecting-rods. The big-ends are lined with anti-friction metal. The cylinders are of close-grained cast iron, and fitted with cast iron pistons having one double-seal compression ring and two oil-distributing rings. The cylinder heads are separate and fitted with four Simplate valves arranged so as to be removable without breaking any pressure joints. The valve seats and keepers are case-hardened, and the discs are of special alloy steel heat treated and ground. The unit is mounted on a cast steel chassis forming a support for all equipment on the one casting. The air delivered by the low-pressure cylinder is led through a finned intercooler worked by a V belt-driven fan operated by the compressor crank shaft. Besides reducing the temperature, the intercooler removes moisture from the air. The intercooler construction is very rugged, following closely that of high-pressure steam heaters. Removable sections, securely bolted to vertical tanks, consist of finned seamless copper tubes

brazed to bronze tube sheets, which, in turn, are brazed to headers. The brazed construction gives assurance against the leaks encountered with cheaper soldered coolers. The use of removable sections facilitates cleaning, and therefore the maintenance of high cooler efficiency. The radiator deals with the water for the engine. It is of the sectional type, with cast iron top and bottom headers. This sectional arrangement allows any section of the radiator to be quickly removed and replaced in the event of damage, and saves the delay and cost of stopping the unit during radiator repairs. The cooling of the circulating water is effected by a large-diameter fan driven by belt from the half-time shaft on the engine. A very simple adjustment is provided for tensioning the fan belt

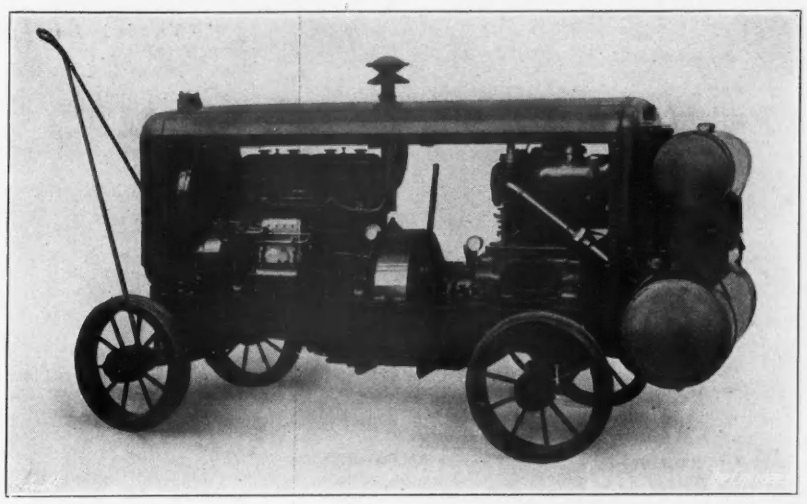

FIG. 25—PORTABLE OIL ENGINE-DRIVEN COMPRESSOR UNIT—CONSOLIDATED PNEUMATIC

drive. The fan is completely enclosed with a heavy wire guard. Both engine and compressor intakes are fitted with efficient air cleaners, thus eliminating the risk of abrasive dust particles entering the compressor or engine cylinders and causing undue wear. All air receivers are of heavy steel plate and conform to the requirements of the insurance companies and British Standard specification. Fuel oil tanks are constructed from heavy gauge steel plate. They are of large capacity and are carried in a cast steel saddle over the air receiver. After-coolers are fitted.

BATTERIES, LTD.

Most of the exhibits of Batteries, Ltd., of Hunt End Works, Reddish, will correspond with those shown last year and illustrated and described in our issue of May 17th, 1935. They will consist of miners' lamps with alkaline batteries, including "Nife" high candle-power cap lamps, which, like the hand lamps, have

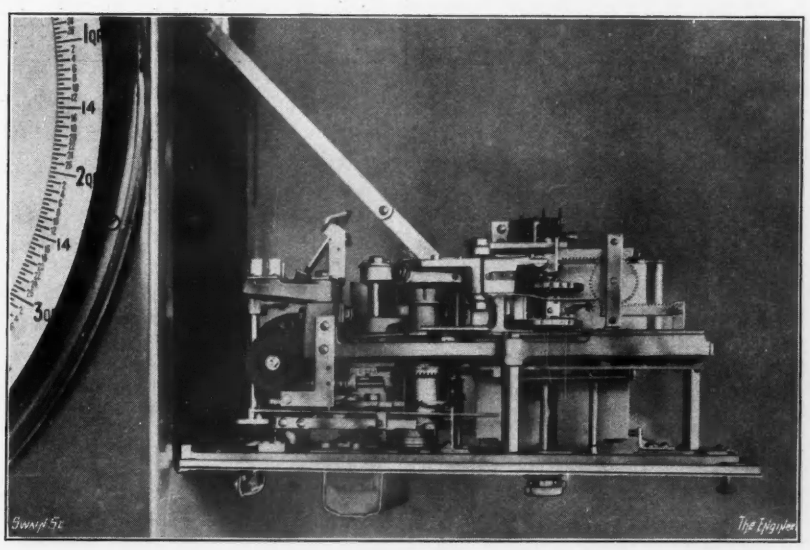

FIG. 26—RECORDING UNIT SWING-OUT ON ELECTRICAL RECORDER—AVERY

been designed to comply with the new mine lighting regulations. Both the cap lamp battery and that of the hand lamp are fitted with mushroom shaped solid terminals, which enable the batteries to be charged in a hanging position and eliminate possibility of corrosion while on the charging rack. The batteries are also fitted with electrolyte level indicators, which facilitate topping up with distilled water. A "Nife" charging rack to be exhibited corresponds to that illustrated in our issue mentioned. Another exhibit is a complete emergency lighting set suitable for emergency lighting in winding engine rooms and other important departments of collieries and industrial works generally. A similar exhibit is the latest type of "Nife" flameproof emergency lighting set for hospital use with a powerful light mounted on a counterpoised swivel arm. "Nife" nickel-cadmium alkaline cells to be seen on the stand are suitable for shaft signalling, yacht lighting, emergency steering on board ship, the operation of telephones, electric clocks, and trucks, &c.

W. AND T. AVERY, LTD.

The exhibits of W. and T. Avery, Ltd., of Soho Foundry, Birmingham, will include a number of new machines besides the ranges of weighing, counting, and testing machines for which the firm is well known. Among the new machines is a tin-plate grading machine, which receives tin-plates and automatically grades them according to weight into three groups—correct, light, or heavy. This machine deals with twenty sheets per minute. For use in bakeries there is the "dough scale," a predetermined load weigher with a stainless steel pan. Pieces of dough slide from a conveyor down the sloping side of a pan to the centre for the check weighing operation. Red and green signal lamps indicate whether a piece of dough is light or heavy. There is also the "bread scale," which checks the weight of loaves travelling from the wrapping machine. The chart is provided with two indications only, maximum and minimum weights. The operator slides four loaves at a time on to the scale, and if the weight of these loaves is above or below the predetermined tolerance a red or green light automatically indicates the fact.

But perhaps the most interesting exhibit to the engineer is an industrial visible weigher with weigh-record indicator. This machine, in addition to giving visible indications of exact weight up to high capacities, also prints an accurate record of every load passing over the machine, either on a ticket or a continuous tape, or upon both a ticket and a tape. The machine, which is known as the A.745 electrical recorder, has been designed to supply the increasing demand for an automatic weighing and recording scale. The weighing machine itself is of the firm's standard type of industrial visible weigher, with four depositing or unit weights, fitted with an electrically operated recording unit of particularly robust construction. We illustrate the machine in Fig. 27. This recorder is both fool and fraud proof, and as such is acceptable by the weights and measures authorities for trade use. It can be fitted to a wide range of scales from a platform machine to the largest weighbridge. The impact impression gives a clear and indisputable record of the weight. Owing to the action of a fraud-proof device the mechanism cannot be operated until the weighing machine is in equilibrium, nor

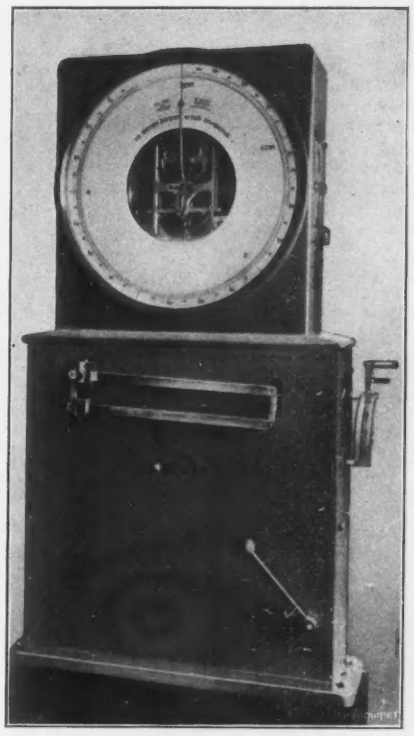

FIG. 27—ELECTRICAL RECORDER WEIGHING MACHINE—AVERY

is any interference possible during the automatic recording cycle. Adaptability to users' requirements is a principal figures of the design, as will be seen by the following, which are within the scope of standard assemblies. Recording can be arranged for one to twenty-four weighings on a single ticket, and/or records on a continuous tape. In addition, the tape record may be printed in one, two, three, or four columns. Consecutive numbering and code lettering may be recorded with each weighing.

Fig. 28 shows a rear view of the machine with the covers removed. The large type wheel, mounted

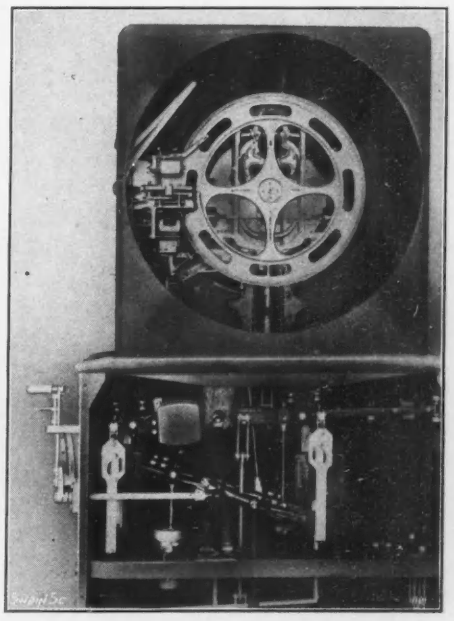

FIG. 28—REAR VIEW ELECTRICAL RECORDER—AVERY

on the indicator spindle running in specially designed ball bearings, carries the type figures corresponding to the minor graduations on the dial. The major graduation figures are on a small wheel—see Fig. 26—mounted in proximity to the large type wheel, the former being rotated by a differential gear which automatically adds the value of the deposited weights to the major graduation figures of the dial. The recording unit swings out, as shown in Fig. 26, and is then readily accessible for examination or the renewal of paper and inking ribbon. The latter is

a standard typewriter ribbon with automatic reversing feed.

RADIOVISOR PARENT, LTD.

Exhibits to be on the stand of Radiovisor Parent, Ltd. of 28, Little Russell-street, W.C.1, are for the most part well known. There will be a Radiovisor lighting control unit, which, together with its allied apparatus, automatically controls artificial lighting by the intensity of daylight; a smoke indicator, a counting unit, an invisible ray burglar alarm, apparatus for the experimenter interested in controlling devices by means of light, and a smoke alarm. Of these exhibits the latter is the most original and is exhibited for the first time. It is a simplified form of the firm's smoke indicator and gives an alarm when a predetermined smoke density is exceeded. If required, a seven-day recorder can be connected to the apparatus to give a record of when and for how long the predetermined smoke density was exceeded.

NIAGARA SCREENS (GREAT BRITAIN), LTD.

On the stand of Niagara Screens (Great Britain), Ltd., Straysfield-road, Clay Hill, Enfield, Middlesex, there will be some models of vibratory screens for sizing materials, such as coal, coke, crushed rock, and so forth, shown in operation running at normal working speeds. We illustrate a typical example in Fig. 29.

The screening surface is formed of wire mesh set at an angle in a plate frame, down which the material gravitates. There may be one or more decks of screen, according to the number of sizes which it is desired to separate out. The whole frame, and screens, is rapidly vibrated through a circular orbit by means of an excentric action having a throw of about $\frac{1}{4}$in. This action tends to throw the material up the slope of the screen, so it is constantly turned over as it gravitates down and a very effective screening is produced, while the mesh is kept clean and the fines fall through rapidly. The vibration is produced by a massive shaft which runs through the centre of the screen frame and is journalled in heavy roller bearings on the main frame. Other roller bearings are fixed in the side frames of the screen, and their inner races are mounted on necks on the shaft which are made $\frac{1}{8}$in. excentric, so that as the shaft rotates the frame is forced to follow a circular path, being supported from the main frame at each end by springs. The excentric weight of the shaft and the screen are calculated to balance one another, so that no vibration is transmitted to the main frame.

The wire mesh is fixed in the framing in such a manner that it is very convenient for changing and replacement. Each side of the sheet of mesh is clamped by bolts between two longitudinal bars, the lower one of which rests on an angle bolted to the side frame. The upper bar is engaged by a series of clips, which can be pulled up tight by bolts protruding diagonally through the frame, so that any desired tension can be put upon the mesh and it is at the same time held down securely on to its bed. Provision is made for accommodating different thicknesses of mesh. All the running parts are made dust-tight and are lubricated on the Tecalemit system. These screens are made to classify materials from 12in. cube downwards to the very finest and can be run either wet or dry.

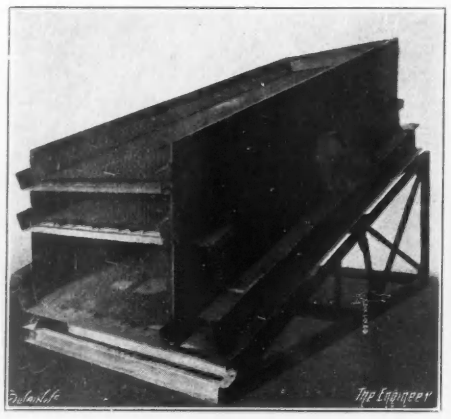

FIG. 29—VIBRATORY SCREEN—NIAGARA

THE GENERAL ELECTRIC COMPANY, LTD.

From an engineering point of view, the most interesting exhibits of the General Electric Company, Ltd., of Magnet House, Kingsway, W.C.2, will be a new air-cooled rectifier and A.C. and D.C. electric welding sets. While no less efficient than the water-cooled type of steel tank rectifier, the new unit, Fig. 30, has the merit of simplicity, and is claimed to save floor space. Air cooling is, of course, particularly valuable in places in which a supply of cooling water is difficult to obtain. Three six-anode rectifiers of this type, with a full load capacity in each case of 450 ampères, at pressures up to 800 volts on the D.C. side, are being installed by the London Passenger Transport Board for traction service.

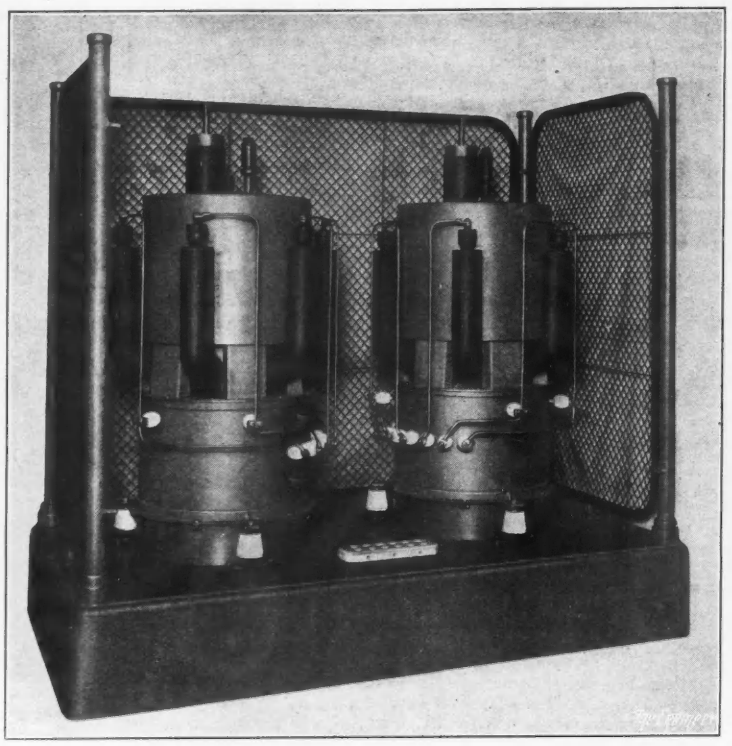

FIG. 30—250-KW AIR-COOLED STEEL-CLAD RECTIFIER UNIT—G.E.C.

The A.C. arc welding set shown in Fig. 31 consists of a transformer with its primary wound for a single phase or three-phase supply, as required, and having a secondary winding, giving an adjustable striking voltage of 70/80 volts. Stability and current control are given by a choke coil enclosed with the transformer in the oil-filled tank, and with tappings taken to a current selector switch.

FIG. 31—A.C. ARC WELDING SET—G.E.C.

The D.C. arc welding set exhibited consists of a motor generator with a single steel sheet enclosing the motor stator and the specially designed field system for the generator. A single shaft mounted on ball bearings carries the squirrel-cage rotor and the D.C. armature. The generator has the usual drooping characteristic, with an open circuit voltage of 75/85. Maximum voltage response is provided, giving corresponding arc stability over the whole welding range of 50–300 ampères. For metallic arc welding, the set is designed to give a maximum of 300 ampères at 25/30 volts and 200 ampères at 45 volts for carbon arc work. By means of two regulators the current can be varied in very fine steps, one giving comparatively coarse adjustment to suit various electrode gauges, and the other an ample range of current for each gauge. A direct to line push-button starter is built into the casing. The whole equipment, including wheels and draw bar, weighs less than 1000 lb.

BRITISH TRANE COMPANY, LTD.

The Vectair heaters, which were fully described last year in THE ENGINEER B.I.F. Supplement, remain generally unaltered. They are to be seen on the stand of the manufacturers, the British Trane Company, Ltd., of Vectair House, Newcastle-place, Clerkenwell, E.C.1. A slight change has taken place in the design of the electric Vectairs, which are a later development of the steam and hot water Vectair. The hand-controlled models for 1936 have the same advantages as before, but are now housed in the new type Trane grille and detachable front panel. They have, in addition, red bulls-eye pilot lights fitted in the end panels on the right hand as standard, thus indicating at a glance when the heater is in operation. For non-thermostatic models this is an advantage in that it indicates immediately whether a heater, which might well have been disconnected when the room or office was not to be occupied for a considerable period of time, has been unintentionally left in operation. The new thermostatic models have the front panel of the cabinet clear of all attachments or control gear, the whole of this being fitted to the back panel on a simplified arrangement giving yet greater ease and efficiency of control. The thermostatic models operate within 2 deg. differential. The regulator is on the front and is illuminated, giving the same advantages as the pilot light does on their other standard models.

HOLDEN AND HUNT.

Low-voltage resistance welding machines are to be shown by Holden and Hunt, of Cox's-lane, Old Hill, Staffs. The machines are of the spot, butt, and flash butt types and they are all to be seen in operation. The "Autobutt" non-ferrous welding machine, shown in Fig. 32, is new. It welds copper rods with an area up to 0·5 square inch and is rated at 80 kW. Like others of the firm's machines, it has a low ball bearing mounted pivoted arm welding head giving sensitive motion and eliminating slides that collect current. The upsetting pressure covering the range $\frac{5}{16}$in. to $\frac{3}{4}$in. diameter has micrometer adjustment. Eight heating speeds cover the machine's range. A cut-off operates on the completion of the weld and a press button starts it, the welding current being conducted through a contactor switch.

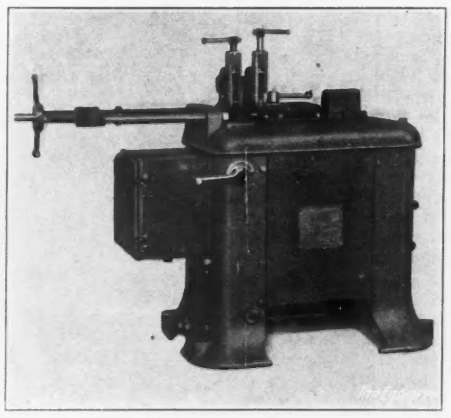

FIG. 32—NON-FERROUS BUTT WELDING MACHINE —HOLDEN AND HUNT

THE ENGINEER.

The British Industries Fair at Birmingham.

Descriptive Supplement No. 2.

The British Industries Fair at Birmingham.

IN this Supplement we continue our descriptions of the exhibits at the Engineering and Hardware Section of the British Industries Fair at Birmingham, which opened last Monday and will remain open until February 28th. We mentioned in the introduction to the Supplement in our last issue that owing to the reduced interest of the Fair as far as medium and heavy engineering is concerned, we had encountered difficulties in carrying out our usual policy of directing attention to exhibits of novelty or special interest. We have also had to contend with a certain lack of enthusiasm among manufacturers themselves, for very many firms have provided us with the information that their exhibits are more or less precisely similar to those on the stands last year. Since these same firms show an entirely different spirit at other exhibitions, we are forced to the supposition that the attitude arises from a feeling that the Fair is becoming of minor importance to them. Nevertheless, we hope that the information contained in this and the previous Supplement, together with that which has already been published in the pages of the accompanying issues and will be published in later issues, will be found interesting and instructive. But we reiterate once again the warning that the title of the Fair must not be taken literally, as the exhibits are not truly representative of what the engineering industries of this country are capable of producing.

Coal Utilisation Council.

This year the joint exhibit of the Coal Utilisation Council and the Coal-burning Appliance Makers' Association at the British Industries Fair consists of twenty coal-burning appliances which are being shown on the stand, the majority of them in actual operation. They range from automatic stokers for central heating or industrial boilers to domestic appliances. The exhibit also includes a representative display of coals of various grades and for various purposes, and special demonstrations of automatic methods of firing for reheating, annealing, and muffle furnaces. Individual exhibits include the following :—An underfeed mechanical stoker, which is shown by International Unicalor Company, Ltd., Wolverhampton. The stoker is attached to a typical furnace, as used in drop stamping works, many of which have hitherto used oil, owing to the difficulty of maintaining uniform temperature with hand-fired solid fuel. Unicalor stokers completely remove this difficulty and effect an economy of 50 to 70 per cent. They are made in various sizes, ranging in coal feed from 8 lb. to 1000 lb. per hour. They can also be used for annealing, muffle, and heat-treating furnaces and core ovens. The fuel used is bituminous washed or dry-cleaned peas or beans or nutty slack. There is no smoke. Manda Ray automatic boilers are shown by British Heating Industries, Ltd., Bolton. They are capable of producing 275,000 B.Th.U. per hour. The utilisation of gravity feed results in a compact unit taking up very little floor space. The feed is automatic and continuous. The amount of clinker is remarkably small. There are no mechanical parts to get out of order. The air is preheated by being drawn round a smoke pipe, which is enclosed in galvanised sheets; increased efficiency is thus obtained.

Gibbons (Dudley), Ltd.

A full range of high-class refractory materials for all purposes is shown by Gibbons (Dudley), Ltd., of Dibdale Works, Dudley. In addition to bricks and special shapes in fire-clay and high alumina materials, furnace engineers in particular will be interested in the range of super refractories of carborundum, fused alumina and Sillimanite, and also in the Gibbons H.T.1 refractory insulating brick. The latter, which has only recently been introduced, has a heat conductivity five times less than that of fire-brick, and may be used without deterioration at temperatures up to 1350 deg. Cent. The firm is also exhibiting the latest model Gibbons continuous annealing or heat treatment furnace illustrated in Fig. 1. It is fitted with a novel type of conveyor mechanism, known as the "Baldwins-Marchant" furnace conveyor gear. Originally designed for conveying steel bars for sheet and tin-plate manufacture, through a reheating furnace, Messrs. Gibbons Brothers have now developed it for conveying steel trays carrying pressings, stampings, &c., through a heat treatment furnace. The gear is of the intermittent pusher type, but is so arranged that each pan or bar is pushed separately for the whole length of the furnace, and the pans are not therefore subject to compression whilst at a red heat, as is the case with the ordinary type of pusher furnace. The furnace also automatically empties itself at the end of the day's work, which is not possible with the ordinary pusher gear. In the furnace shown in the photograph, the annealing pans are carried through on heat-resisting cast iron slides or supports, and they are moved forward through a fixed distance at regular intervals by means of special heat-resisting steel tubes, which are provided with suitable fingers or lugs welded to the tubes. One end of the tubes is connected to a common cross-head, which is mounted on the piston-rod of a hydraulic cylinder. A toothed quadrant on each tube enables the tube to be rotated by means of a rack connected to a second cylinder at the side. This rack also drives a gear to operate both doors of the furnace. The operation is very simple. Pans containing work to be annealed are placed on the slide rails at the charging end of the furnace and the operator moves the valve lever. The following movements then take place :—First, the doors open and the tubes turn 80 deg. up, so that the fingers are in position to engage all pans; secondly, the tubes move forward through a fixed distance, new pans pass into the furnace, those already in are moved forward, and the leading pans emerge at the discharge end; thirdly, the doors close and the tubes turn down; fourthly, the tubes return to their original position and the valve gear closes.

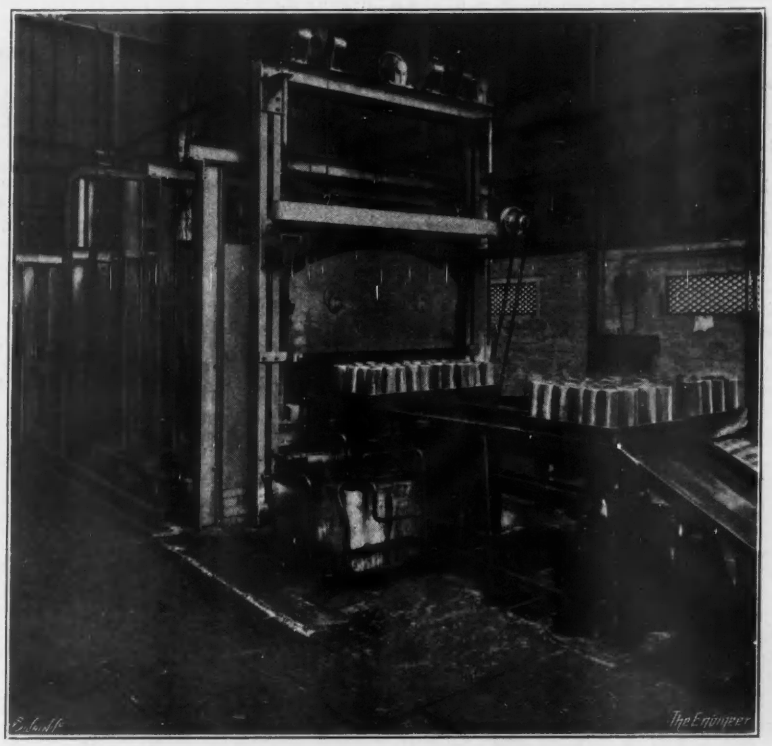

FIG. 1—CONTINUOUS TREATMENT FURNACE—GIBBONS

Imperial Chemical Industries, Ltd.

The theme of the main I.C.I. stand at the British Industries Fair is the technical service offered to customers. There is a working exhibit of the water treatment service and another concerning dyestuffs and dry cleaning. They are staged on laboratory benches, and behind them are diagrams showing how the technical service system operates. Since new products and processes are continually being developed and new uses found for existing products, an elaborate system of technical service has been built up to become an integral part of the company's work. The technical service department has at its disposal a large amount of accumulated information, together with comprehensive and up-to-date libraries of scientific works, and members of the department will be on the stand to answer questions. When original research is needed to solve some problem that may involve the company's products, the I.C.I. research departments are available. The demonstration of water treatment service show analytical methods employed to determine the composition and hardness, &c., of various types of water. A specially designed water-softening apparatus is in operation to illustrate the principles involved in water softening and the method of using chemicals such as sodium carbonate, sodium aluminate, and "Limbux" (hydrated lime) in the lime-soda process of softening. There is also shown the way in which boiler tubes become scaled and the methods of removal of scale, the use of sodium aluminate in the coagulation of impurities in water, the effect of hard and soft water on soap, and a microscopical exhibit of the effects of caustic embrittlement on boiler metal.

The Billingham plant for the hydrogenation of petrol from coal, which was fully described in THE ENGINEER of November 29th, 1935, was officially opened on October 15th last. Its general and technical interest is attracting visitors to see the model which is shown on the stand. While the process is far too complicated to be shown in any but a very simplified form, an ingenious device of flowing bubbles enables the visitor to follow the continuous operation of converting coal into petrol. The Cassel method of case hardening differs from pack hardening in that instead of employing a compound in the solid state as the means of introducing carbon, it uses a case-hardening agent in the molten state. On the I.C.I. stand this year there are shown three furnaces working on case hardening, including an oil-fired furnace for light

cases, and a "Rapideep" furnace gas-fired, this being a comparatively recent introduction for obtaining a deep coat with rapidity. "Rapideep" is used with the ordinary case-hardening bath, but the case depths obtained, besides being deeper than those conferred by a cyanide bath, have the advantage of being glass hard for over half their depth as compared with a third in cyanide, so that grinding allowances are greater. Where distortion is absolutely unavoidable, the "Rapideep" method is particularly suitable.

A new introduction is an electrically-heated furnace with a carboneutral bath. It is of particular value for the hardening of high-speed steels.

The treatment of metal parts for the removal of oil, grease, or swarf, is an operation which enters

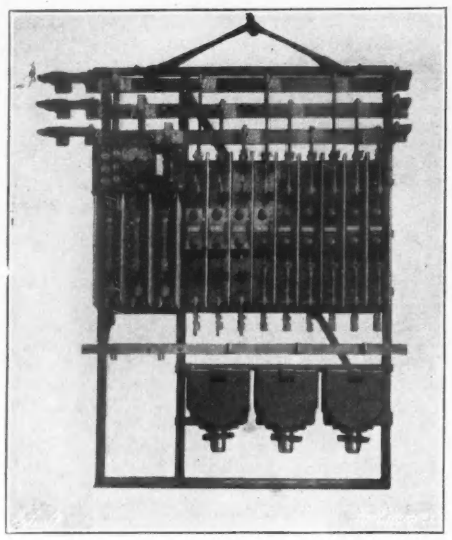

FIG. 2—MEDIUM TENSION FEEDER PANEL—DONOVAN

into many branches of industry, from the cleaning of motor car parts before repair to the preparation of a chemically clean surface prior to plating or rustproofing processes. I.C.I. degreasing plants are used for removing oil, grease, swarf, or polishing compounds from metal parts prior to overlaying, enamelling, cellulose spreading, electro-plating, lacquering, sand blasting, bonderising, parkerising, rustproofing, &c. Trichlorethylene is employed as the solvent, and the only other requirements are a heating device, supplies of cold water, and connection to a water drain. The plants have proved their value in many trades, each extension of use being met by adjustments and improvements in design. On the stand there are shown working models of different types selected from the present range of stationary and continuous plants with a background of typically degreased articles.

DONOVAN ELECTRICAL COMPANY, LTD.

Among the exhibits of the Donovan Electrical Company, Ltd., of 46–47, Charles-street, Birmingham, 3, is the medium tension feeder panel, Fig. 2,

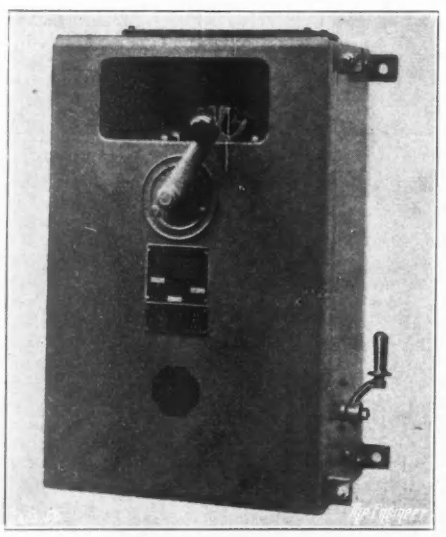

FIG. 3—SLIP-RING MOTOR STARTER—DONOVAN

with 1500-ampère main switches, 500-ampère circuit switches, and "Scrutact" fuse holders for use with English Electric standard 25,000 kVA rupturing capacity cartridges or other makes of fuses if specified.

As the contacts are solid and pressed together by a powerful wedge, all fuse contact heating troubles are claimed to be eliminated. The design incorporates two insulated screw handles on the bridge by means of which all connections from bus-bar to the cartridge are clamped together. The contacts are solid and the tab of the actual cartridge and the base block are forced together under a 2000 lb. pressure. This is effected by the action of a wedge in each bridge contact. The resultant perfect contact is claimed to give the coolest possible running, but even if high temperatures be transmitted from the cartridge they can do no harm as there are no springy contacts to soften under heat. The ease with which the bridge can be inserted or withdrawn saves time. Cartridges can be renewed in five seconds as they are only clipped. By the one tightening operation the screw handles on the bridge press the cartridge tongues with great force directly against the fixed base contacts, or, if cable has to be taken from one end, the cartridge tongue is pressed forcibly on to the cable socket itself.

The insulated handles are self-locking and do not vibrate loose. Their tightness can be checked or completed when the fuse is alive and carrying current.

The combined stator and rotor motor starter for slip-ring machines (Fig. 3) has a triple-pole stator contactor interlocked with the rotor starter, and it is impossible to switch the motor on to the line unless all the rotor resistance is in circuit. Inverse time limit overload and no-volt protection are provided, and in the event of overload or failure of the voltage the motor cannot be restarted unless all the rotor resistance is inserted in the circuit. The starter is also free to trip an overload during the starting period.

THE CARTER SHOCK ABSORBER COMPANY, LTD.

Two types of hydraulic press cushion are shown by the Carter Shock Absorber Company, Ltd., of Oldbury-road, West Bromwich. The larger unit is shown in three sizes. It is an entirely self-contained unit working on oil and requiring no accumulators or compressors, the press to which the cushion is attached providing all the necessary motive force. It is designed to give at the operator's selection an increasing, a decreasing, or a constant pressure throughout the draw or forming operation, thus enabling the ideal blank-holding pressure to be exerted whatever may be the nature of the pressing being made. This control, of course, reduces the number of operations and interposed annealings, as well as materially lowering the scrap percentage. The smaller unit is a self-contained simplified version of the larger model. It is designed for presses of from 10 to 40 tons exerted pressure and working at high speeds. The cushion retains the broad principles of previous models, but moving parts have been reduced to an absolute minimum, the only parts in motion during the formation of a pressing being the two plungers, and as these plungers are fitted with ordinary cast iron piston rings and are always immersed in oil, the amount of wear on them is quite negligible. The problem of oil thinning in operation has also been successfully dealt with by a variable-throw pump, the variation in throw being quite automatic and simple, and

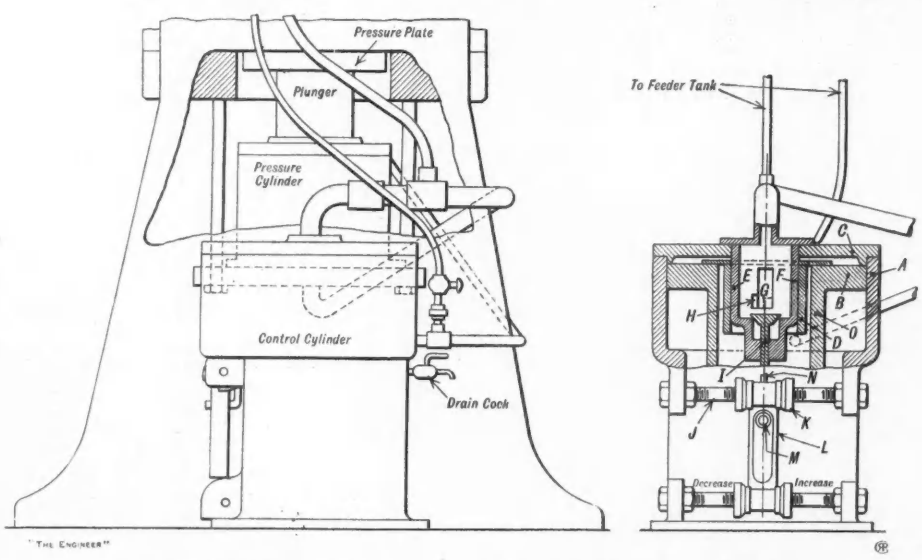

FIG. 4—HYDRAULIC PRESS CUSHION ASSEMBLY AND SECTION—CARTER

governed by the amount of leak, so that the exact leakage is replaced on every stroke under all circumstances. The cushion has also an improved four-point suspension system and the valve setting on the worm gear principle is also much simpler. The Carter press cushion consists essentially of a pressure cylinder and a control cylinder, which is double the area of the pressure cylinder, and these cylinders are connected one with the other, either directly or indirectly by piping. Figs. 4 and 5 show sections of the two models. The pressure cylinder, which is a plain cylinder with a well-fitting plunger therein, is charged with oil below the plunger, and is anchored to the press. The mechanism of the control cylinder, although still simple, is necessarily more elaborate than that of the pressure cylinder, as it is here that the pressure to be exerted on the blank is selected and controlled. It is not directly attached to the press, but may be situated in any nearby position where most convenient for operation. On the descent of the press ram, oil is forced out of the pressure cylinder into the control cylinder where its pressure is controlled as follows:—The cover of the control cylinder is fitted with a depending hollow stem F, into which the fluid from the pressure cylinder is discharged during the downward movement of the press ram. In the side and towards the bottom of this hollow stem is a rectangular port H, which serves as an outlet for the fluid, and below this port is a valve I, which is free to uplift on the upward movement of the press ram, and thus relieve the fluid of pressure and enable the tools to return to normal position rapidly. Closely

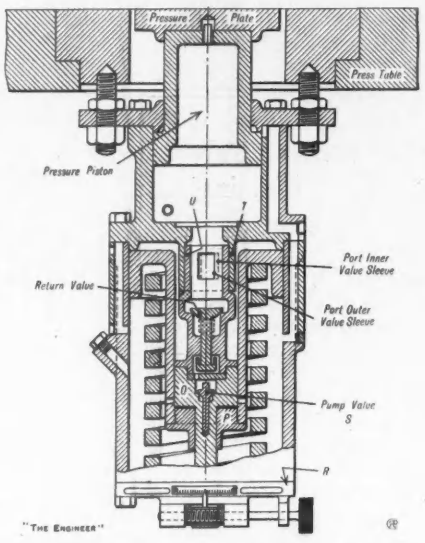

FIG. 5—SMALL PRESS CUSHION—CARTER

fitting round the stem is a sliding sleeve D, which is carried up and down on the stem by the movement of the plunger B, to which it is attached. This sleeve also has a rectangular port G of the same width as the port H, but of greater length. The two above-mentioned ports constitute the pressure-regulating and controlling mechanism, and when they are fully open the ports are in exact registration, the bottom of the sleeve port coinciding with the bottom of the stem port. Attached to the top of the sliding sleeve is a gear which is secured to the top of the plunger B, but which is free to revolve thereon, the gear meshing with a second gear attached to the rod N, which passes through the plunger B and out through the bottom of the large portion of the cylinder A. Here it is bent at right angles, and has fitted to its end the roller M, which works up and down in the slot of the guide L (actuated by the movement of plunger B), and controls the fluid pressure in the following manner:—The guide L is adjusted laterally across the bottom of the cylinder by means of the knurled nuts K, working on the screwed rods J, and this lateral movement rotates the rod N, and through the medium of the meshing gears rotates the valve sleeve D, thereby regulating the size of the discharge aperture through which the fluid is forced to pass during the descent of the press ram, and thus governing the initial pressure exerted on the blank to be formed. In addition to this lateral movement, the roller guide L can be set at any angle to the cylinder bottom, sloping either to the right or the left, so that during the descent of the plunger B the valve can be either opened or closed, thus giving a decreasing or an

increasing pressure, as the case may be. If the guide is set vertical, the valve aperture remains stationary, and the pressure is, of course, constant throughout the drawing operation. As constructed, the valve sleeve D is enclosed in the hollow stem O, Fig. 4, of the plunger, the stem being of sufficient diameter internally to provide an annular space between the two members, so that fluid passing through the valve may flow freely. The stem O is open at the top to enable the fluid to flow over the plunger and thus depress it, and closed at the bottom by a screwed plug. Reference to Fig. 4 will make this clear. Situated well below the sleeve valve and near the bottom of the stem O, Fig. 4, is another piston O, Fig. 5, which is attached to the bottom plate R and thus held stationary, and so alters its position in the stem as the plunger B travels up and down. It constitutes a pump, the function of which is to deal with all leaking fluid and return it to the top of the plunger. The operation is as follows:—The lower end of the stem O, Fig. 4, which constitutes the pump barrel is always immersed in a well into which all leaking fluid drains. The pump plunger is mounted stationary within the barrel and is unaffected by the movements of the plunger B. Towards the bottom of the barrel are a number of ports which, when the control plunger B is at its top position, are covered by the stationary pump plunger. On the downward movement of the plunger B, these ports are uncovered, and fluid enters the pump through them and below the pump plunger. On the upward movement of plunger B this fluid is ejected from the pump through the ports and back into the well until such time as the ports are again closed by the pump plunger. Thereafter any remaining fluid is forced through the non-return valve S, and into the main body of fluid above the plunger B. To deal with variations in leakage the pump is given a throw capacity greatly in excess of the greatest leakage factor (the leak factor, of course, varying with the fluid pressure), so that during the first few strokes of the press, the pump is throwing more fluid than is leaking. This excess fluid depresses the plunger B,

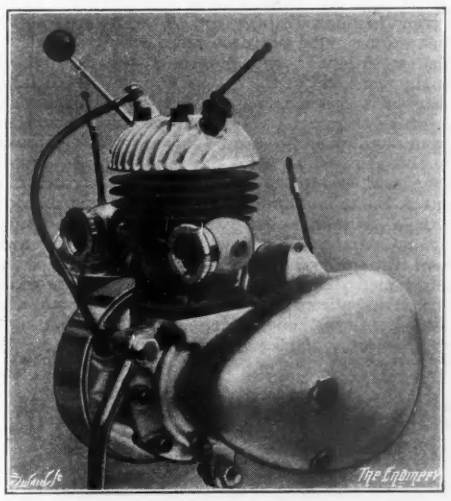

FIG. 6—125 CC. MOTOR CYCLE ENGINE—VILLIERS

preventing it reaching its top position, until such time as the pump plunger no longer covers the ports in any position, when all fluid taken in by the pump is simply passed back into the well. This state continues until such time as leakage allows plunger B to rise higher, when again the pump ports are covered by the pump plunger, and fluid is once again ejected through the non-return valve and above the plunger B. In actual practice, a state of balance is reached whereby plunger B is held in a stationary top position by the throw of the pump, which is always and under all circumstances replacing the exact amount of fluid leaking.

An additional feature of the pump is that it serves as a brake at the top of the stroke, and thus effectually deals with rebound which is the cause of so much trouble with other sub-pressure devices. Fig. 4 will make quite clear the sequence of operations, and also the method of charging and discharging the cushion.

With regard to the small new type cushion, illustrated in Fig. 5, the essential difference between it and the larger types is in the sleeve valve. It has been found in practice that for small pressings up to about 2in. deep, the decreasing and increasing pressures are unnecessary, and so a valve has been designed which has no sliding members, and which gives a constant pressure only during the forming operation. The mechanism of this valve is as follows:—The outer sleeve T is attached to and dependent from the bottom of the pressure cylinder, and the inner sleeve U is attached to the stationary pump plunger. It will thus be seen that both valve members are held stationary and are unaffected by the movements of the cushion plungers. Both sleeves have rectangular ports in the side, which are in vertical registration. The stem of the pump plunger to which the inner valve sleeve is attached carries at its extremity a worm wheel, which is in mesh with a rotatable worm, as shown on the drawing. By this means the ports can be set at any degree of lateral registration, thus governing the aperture through which the fluid is forced, and so controlling the pressure exerted on the blank being formed. The main object of this valve is to reduce the number of moving parts and thus eliminate wear. The pump of this cushion operates in the same manner as that in the larger cushions, but its throw is comparatively greater to deal with excess leakage due to the thinning of the fluid caused by rather large variations of temperature. All Carter cushions are entirely without glands or packings of any description, as all leakage is internal, and dealt with very adequately by the pump.

THE VILLIERS ENGINEERING COMPANY, LTD.

On the stand of the Villiers Engineering Company, Ltd., of Wolverhampton, there is exhibited a representative display of air-cooled and water-cooled

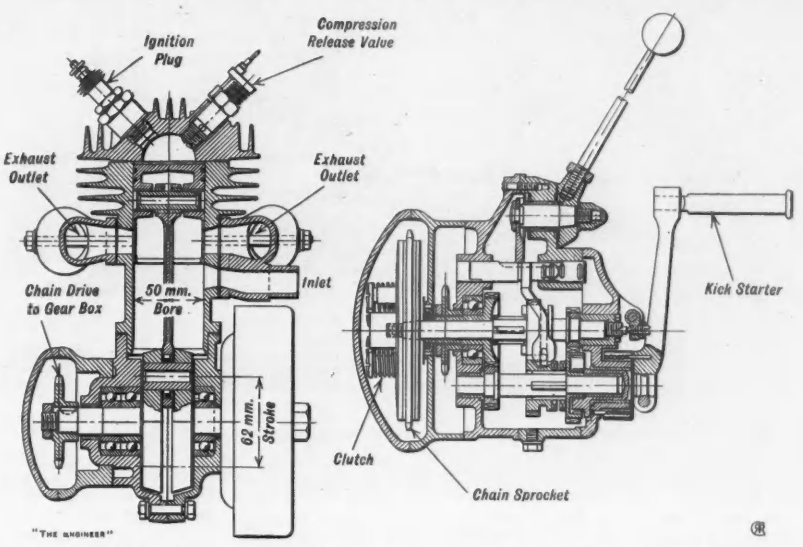

FIG. 7—125 CC. TWO-STROKE MOTOR CYCLE ENGINE AND GEAR-BOX—VILLIERS

engines for industrial and stationary purposes and for motor cycle and road traction service.

In an article published in THE ENGINEER of November 9th, 1934, we described the Marston-road works of the company and the range of engines manufactured by the firm, but at the Birmingham Fair several new air-cooled models are exhibited, some for the first time. We have chosen for illustration—see Figs. 6 and 7—the new 125 cc., Mark VIII D, single-cylinder, two-stroke engine and three-speed gear-box which has been specially designed for light motor cycles. The engine which has an output of 2½ b.h.p. at 2500 r.p.m., has a bore of 50 mm., with a stroke of 62 mm. The crank case carries the three ball bearings for the crankshaft, and there are two plain outside bearings for compression. The connecting-rod has a roller bearing big end with a plain small end bearing and a floating gudgeon pin. The

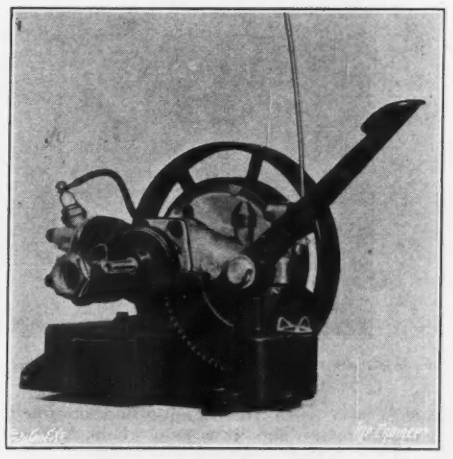

FIG. 8—CENTURY KICK-START ENGINE—VILLIERS

cylinder and cylinder head are made from a special aluminium alloy and are furnished with deep fins for cooling. The cylinder head carries an ignition plug and a compression release valve for easy starting, and is so designed that it can be turned through 180 deg. to give two positions of the starting plug and inlet manifold. Ignition current is provided by the Villiers patented fly-wheel type magneto, which is of small size to meet the engine requirements and also carries coils for direct lighting. The carburetter is of the Villiers Midget type. Lubrication is effected by mixing one half pint of lubricating oil with each gallon of petrol. The gear-box is shown in section in Fig. 7, and is designed to give three speeds with ratios of 1 : 1, 1·62 : 1, and 2·92 : 1. There is a kick starter and a hand-operated cork clutch. The transmission is by a ⅜ pitch Reynolds chain, 0·225in. wide. The power take off sprocket has thirteen teeth the engine sprocket nineteen teeth, and the clutch sprocket forty-four teeth.

Another interesting engine is the Century kick-start engine shown in Fig. 8. It has a bore of 50 mm., with a stroke of 50 mm. and a speed range of 1200 to 1800 r.p.m., the recommended output being 0·75 b.h.p. at 1750 r.p.m. In general design the engine follows closely that of the Mar-Vil 0·6 b.h.p., described in our issue of November 9th, 1934. These two engines form very small and compact power plants, which are widely used in various industries. The firm is also exhibiting a full range of Villiers free-wheels, sprockets, and two-speed gears, along with representative stampings and non-ferrous castings made in the firm's new stamp and foundry departments in the former Sunbeam car works. These works have been newly equipped and have greatly increased the facilities of the Villiers Engineering Company, Ltd., for producing component parts of these special types.

A. C. WICKMAN, LTD.

The stand of A. C. Wickman, Ltd., Coventry, is devoted to a wide range of tools and dies, etc., tipped with Wimet brand tool metal and special grinding wheels and Spedia lapping wheels for preparing their edges. We illustrate typical examples in Fig. 9.

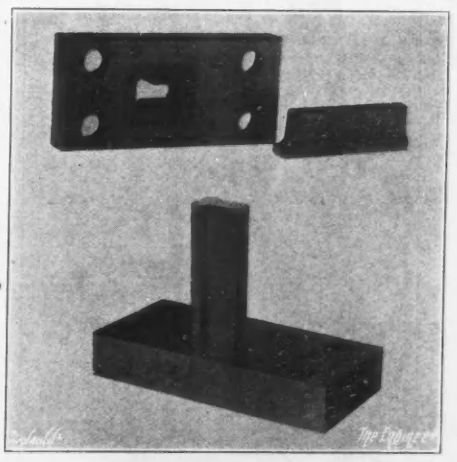

FIG. 9—WIMET METAL TIPPED PUNCHES AND DIES—WICKMAN

The new XX grade of Wimet is a cemented tungsten carbide, but it has the addition of a certain proportion of titanium carbide, which greatly reduces the tendency to cratering under the action of chip flow, as the new metal has a lesser affinity for steel than plain tungsten carbide. It has, however, a rather lower tensile strength, so tools with smaller clearance angles and greater included angles must be adopted. By grinding a flat lip on the surface of the tip, the chip can be curled away from the tool or a special chip curler can be clamped on the top of the tool. Lathe tools of this kind can be used at speeds of 520ft. per minute on 0·7 per cent. carbon steel having a tensile strength of 55 tons per square inch. In such a case the depth of cut might be ⅛in. and the feed 1/₄₄in. per revolution. Other applications of Wimet metal are for inserted blade milling cutters, wood-working tools, twist drills, spot face cutters, glass and marble drills, gauges and work slides for centreless grinders.

There are also shown some grinders, Spedia lapping wheels, Spedia hand laps and grinding wheels.

Spedia lapping wheels are used for the final lapping of Wimet brand cutting tools, gauges, and other hard metals where an exceptionally fine finish is required. They are the only known free cutting wheels which will give a fine finish to the cutting edge. Tools lapped with Spedia wheels are said to have a definitely improved cutting edge, giving longer life between regrinds, higher production and improved finish of work. On woodworking tools, the Spedia lap is especially valuable. The Spedia hand lap is a further application of the principle of Spedia lapping.

TAYLOR-TAYLOR AND HOBSON, LTD.

The most interesting exhibit of Taylor-Taylor and Hobson, Ltd., of Stoughton-street Works, Leicester, is a profile projection equipment for the workshop examination of form tools, gauges, &c., which do not lend themselves to convenient measurement by ordinary means. Referring to Fig. 10, which shows the details of the projector unit, the work is mounted on the "T" slotted table A, which has screw-operated motions in both directions in the horizontal plane, and is arranged to enable precise settings to be made by means of a depth micrometer. According to its character, the work may be supported in vee blocks, or between centres. Alternatively, it may be clamped to an angle plate or be supported

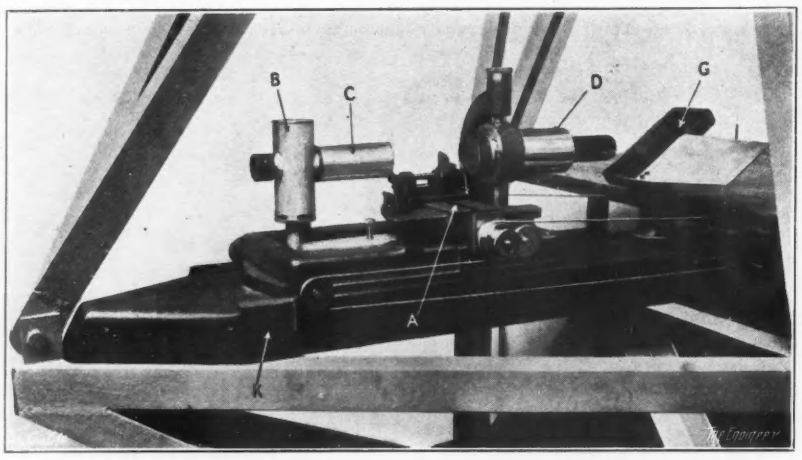

FIG. 10—PROJECTOR UNIT OF PROFILE PROJECTION EQUIPMENT—TAYLOR-HOBSON

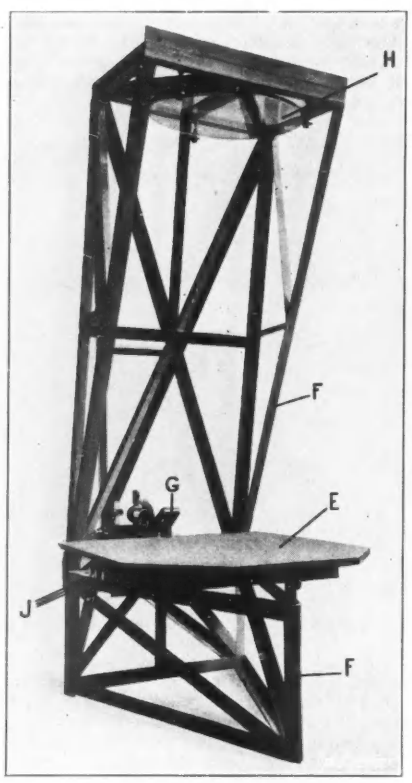

FIG. 11—PROFILE PROJECTION EQUIPMENT—TAYLOR-HOBSON

by any other convenient means. A lamp housing is shown at B and a condenser at C. The lamp is a special projector filament type unit, and as it is prefocused adjustment when it is renewed is avoided. D is the projection lens which, like the condenser and lamp housing, can be adjusted vertically to deal with work of different heights, whilst to accommodate for the helix angle of threaded work the condenser and lamp housing are capable of angular adjustment. The projection unit is mounted together with the screen E, Fig. 11, upon a supporting framework F, composed of structural sections welded together. As it is of triangular construction rigidity is ensured. and free access is given to the screen on three sides.

For convenience in transport, the frame is built up of three sections, which are bolted together. Light from the projection lens is thrown upwards by the inclined mirror G on to a second mirror H immediately above the screen, and is reflected vertically downwards on to the screen. Focusing and adjustment of the work are controllable at the projection unit and also at the two sides of the screen by remote control knobs J.

By means of interchangeable lenses the screen can be covered at various magnifications. With the standard values 50, 30, and 20, the diameters of field at the work are 1¼in., 2in., and 3in. respectively. With each change of lens a small adjustment in the projector position relatively to the screen is necessary, and is obtained by adjustment of the projector unit bodily along ways machined in the sub-bed K. The Taylor-Hobson patented lenses used in this projector are claimed to represent a big step forward and are believed to be the first lenses specially designed to meet the requirements of this kind of work. There is a fundamental difference in the kind of correction required in a lens used for ordinary photography or projection, and one required for the projection of shadows in parallel light. The difference between the conditions for which it was designed, and the conditions in shadow projection, causes an abnormal amount of distortion to appear in ordinary lenses.

The overall accuracy obtainable in practice depends also upon the rigidity and accuracy of alignment of the apparatus as a whole, and in the case of the equipment described is within ±0·0005in. at any point within the field of projection. A feature of the equipment is that the design throughout is on a unit basis, enabling various alternative arrangements to be built up to meet individual requirements. While the complete arrangement described ensures great accuracy and convenience, the projection unit can be supplied separately, without the mirrors and supporting framework, the screen in this case being mounted vertically 17ft. away. The apparatus then corresponds to a projector of the ordinary horizontal type, but covering an exceptionally large field with a very high order of accuracy.

SIEBE, GORMAN AND CO., LTD.

Siebe, Gorman and Co., of 187, Westminster Bridge-road, S.E.1, are exhibiting their well-known specialities, including a full-size figure of a diver equipped with the latest type of self-contained apparatus, which dispenses with the use of the ordinary air tubes and pump. Various types of self-contained oxygen breathing apparatus for work in irrespirable atmosphere—"Proto," "Salvus," and "Fireox" types, which have been very extensively adopted by rescue stations, collieries, fire brigades, gasworks, iron and steel works, &c., resuscitating apparatus, "Novita" and "Novox" types, oxygen and oxygen plus CO_2 systems for the apparently asphyxiated or drowned, gas masks for naval, military, civilian, and industrial purposes are exhibited, together with dust masks of various types, asbestos fire-fighting equipment, safety goggles, and gloves of many patterns, and other protective devices for various purposes.

LAIDLAW, DREW AND CO., LTD.

The introduction of asphalt and bitumen compounds as surfacing and binding materials for road construction produced a new series of problems in connection with repair work. For example, the re-surfacing of such roads is sometimes undertaken with materials which are precoated and heated, but which are applied to the surface existing without in any way preparing it to receive the new materials. In consequence it occurs that the new material does not join with the old, but remains as a loose cover across the road, all too soon to be broken up through the formation of "ripples" under the wheels of modern traffic. To overcome this trouble road heaters were introduced, which, by applying heat to the existing surface, bring it to a warm "tacky" condition, similar to that of the new materials applied and thus ensure the welding together of old and new asphalt or bitumen compound, as the case may be. A road heater which is light, easily handled, and efficient is displayed on the stand of Laidlaw, Drew and Co., Ltd., of 52, Frederick-street, Edinburgh, 2, and we illustrate it in Fig. 12. The unit consists of a mild steel channel section chassis fitted with mild steel wheels with cast iron bosses. The front axle is fitted with towing gear, while the rear wheels are fitted with a hand-operated chain-driven "inching" drive for slow forward motion. This gear can be operated from either side of the chassis. A hand brake operates on both rear wheels. At the front end of the chassis is mounted a 1 b.h.p. Lister water-cooled engine, the petrol consumption of which is given as 1 gallon per eight-hour day. From a pulley on the engine a Texrope drive is taken to the fan, which provides the forced draught. The hood, which is 4ft. 6in. long by 4ft. wide and is built of aluminised steel sheets, is provided with a lever-operated cam and link mechanism lifting gear, which allows it to be raised away from the ground for travelling or set at a predetermined distance from the ground for working. The setting allows the hood to touch the ground when needed. As the hood is carried on a hinge bar across the chassis, it is always rigidly aligned with it. The

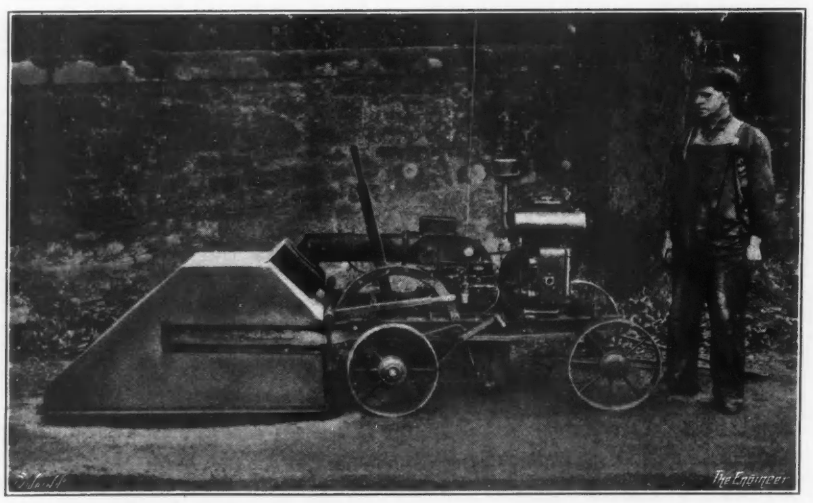

FIG. 12—OIL-BURNING ROAD HEATER—LAIDLAW, DREW

fuel tank is slung beneath the chassis and the unit is designed to consume 40 gallons of light furnace oil of 70 secs. Redwood No. 1 viscosity per eight-hour day. The fuel supply is pumped to the burner by a fuel pump fitted on the fan shaft. Adequate filter provision has been made in the fuel line and the pump provides sufficient pressure to allow the Laidlaw-Drew pressure jet type burner to be used. This burner is the same in principle as that described in THE ENGINEER in the B.I.F. Supplement of February 17th, 1933, when Laidlaw, Drew and Co., Ltd., exhibited it on the Shell-Mex and B.P., Ltd., "oil burning" stand. The design allows of a fine oil atomisation without the use of rotating parts. Only from 10in. to 22in. water gauge air pressure is required. The exit edges of the swirler vanes are tangential to the periphery of the vortex cup and they impart a high rotational velocity to the atomising air. A spin is thus imparted to the oil in the vortex cup, which causes it to be projected at high velocity into the

core of the depression created by the rotation of the atomising air. Thorough atomising of the oil and mixing of oil and air are thus produced before the mixture leaves the exit orifice. The oil valve, oil tube, and vortex cup assembly may be withdrawn in one unit from the burner body for cleaning or adjustment. The heater is so designed that either a direct flame or indirect heating may be applied to the road surface at will.

TAYLOR AND CHALLEN, LTD.

The firm of Taylor and Challen, Ltd., of Derwent Works, Birmingham, shows two high-speed armature notching presses. One, for external notching of rotor discs, has a friction-operated dividing gear and works at a speed of 620 r.p.m. The press is driven by an independent motor mounted on an adjustable bracket on the back of the press. A plate friction clutch is incorporated in the fly-wheel, the outer rim of which runs on roller bearings, and correct timing of its engagement and disengagement is secured by a timing key in the shaft and a cam of the usual type. The press is arranged to stop automatically at the end of one revolution of the index wheel.

Another press, illustrated in Fig. 13, is designed for the internal notching of stator rings after their cores have been separated in a blanking press or in circular shears. The rings are registered by a set edge in a revolving pallet plate, which is bolted to a rotating ring, which also carries the index wheel. This ring rotates on a flat circular carrier checked and bolted to the table of the press. The table is amply large to take various sizes of carriers, to suit stator plates of up to 26in. outside diameter. The dividing mechanism consists of a friction band of large diameter, which, on the idle stroke, pushes the index wheel firmly against its location on the lock bolt, which is adjustable for angle. Both the above presses are shown actually working.

Fig. 13 also illustrates a hot brass pressing machine, shown in operation, the article produced, a tail pipe, being made in one operation from a hot billet. This machine is a geared crank press, with an 8in. stroke, of 100 tons rating, and runs at 60 strokes per minute. The dies are made so that the hot billet is totally enclosed before the punches or anvils enter it to perform the extruding operation. To effect this, the bottom die is held in a spring-supported collar, which is pushed down in the descent of the slide by the face of the top die, until it rests on the solid bolster. The bottom anvil is held directly down on the bolster. In this way the formation of a flash on the pressing is avoided. The same model as that exhibited may be used with split dies for making cored hot pressings. In such a case, a mechanical vice is used for closing the dies, so that the minimum of flash escapes.

A roll feed press is also shown, making parts of

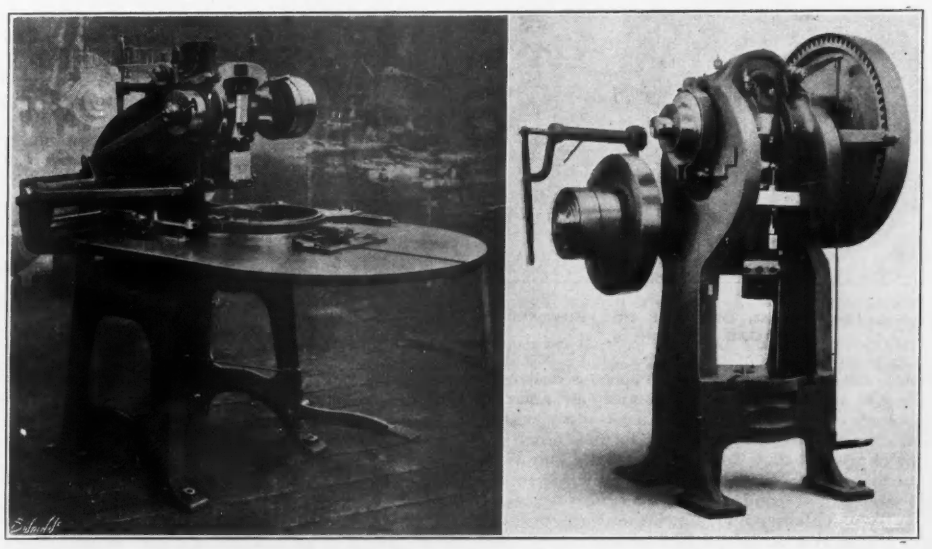

FIG. 13—INTERNAL NOTCHING PRESS AND HOT BRASS PRESSING MACHINES—TAYLOR AND CHALLEN

brace buckles. It has a single pair of feed rolls, driven through bevel gearing from a cross shaft. A roller friction ratchet is provided, enabling the feed to be adjusted very finely. The press is of 40 tons capacity, and is motor driven from an electric motor mounted on a hinged bracket at the back of the press.

W. CANNING AND CO., LTD.

The most imposing feature on the stand of W. Canning and Co., Ltd., 133, Great Hampton-street, Birmingham, 18, is a working model of one of the latest electro-plating and metal finishing plants. The original plant is approximately 100ft. long and is installed in the Manor Mills of the Hercules Motor and Cycle Company, and is for nickel plating. It is followed by another plant which deposits a film of chromium directly on to the nickel plate.

In the nickel plating plant the articles are first immersed in a cleaning tank containing hot cleaning solution working in conjunction with electric current, which very effectively cleans the work to be plated. The solution is continuously agitated by jets of compressed air emanating from the bottom of the tank. A special air blast is provided at the end of the tank issuing from a pipe fixed close to the surface of the solution, which blows scum, &c., back to the incoming end of the tank, at which point it washes over a division into a section reserved for its reception. In this way the surface of the solution is kept clear. Ample swilling is very necessary after each particular process, and a cold water swill follows in a lead-lined

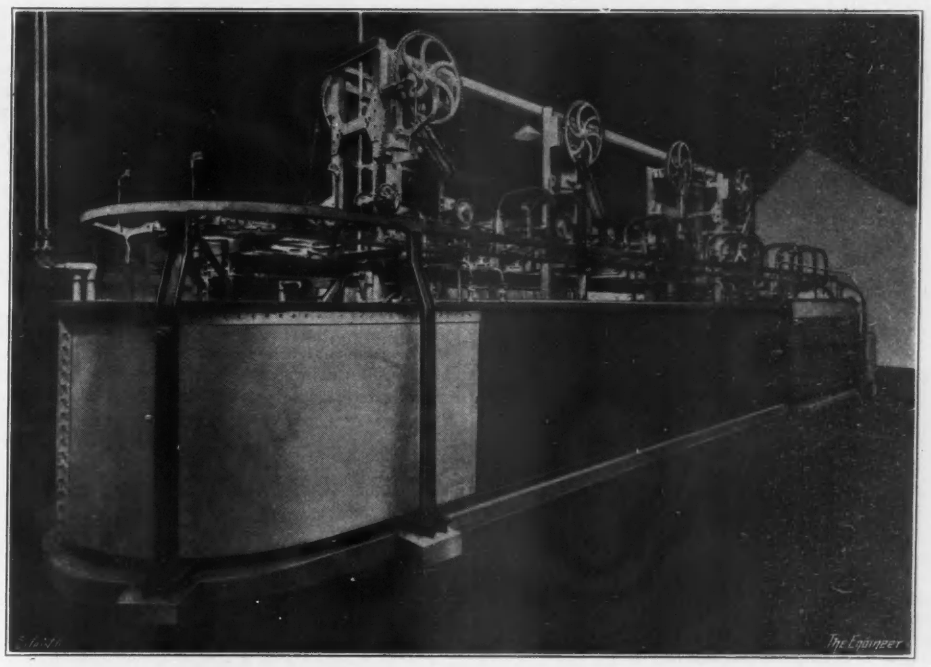

FIG. 14—AUTOMATIC CHROME PLATING PLANT—CANNING

tank containing clean cold water, which is kept in a state of violent agitation by compressed air liberated from pipes at the bottom of the tank. Surplus or waste water flows over a weir at the end of the tank, while the incoming clear water feeds in at the bottom, and in addition a spray is provided over the full width of the tank at the surface. The work is then passed for one half minute through a cyanide solution to remove any oxidation which may have occurred in the preceding preparatory hot cleaning tank. Another cold water swill follows in a similar swilling tank to that already described. An acid dip is the next stage. It is a short-time process and consists of immersing the work in a weak acid solution in order to neutralise any possible trace of cyanide on the work, which would be detrimental to the efficient carrying out of the work. The articles are next immersed in another cold water swill, where they are rendered chemically clean before being transferred to the nickel plating vat.

The actual process of electrodeposition is claimed to ensure a perfect coating of the metal and uniform thickness of deposit on all shapes and sizes of articles put through the plant. The deposition is rapidly effected and the solution is continuously filtered to ensure freedom from suspended impurities. Depolarised nickel anodes of special cross section are employed. The timber vat is lead-lined and is fitted with all the required electrical connections designed to carry the large current necessary. In the bottom of the vat is fitted a series of perforated lead pipes, by means of which air agitation of the solution is obtained to enable a high current density to be used. Immediately after nickel plating the work is required to be again thoroughly swilled in a cold swill to free the articles from any nickel solution, and a final hot water swill follows to bring the articles up to a reasonably high temperature before being removed from the plant.

The automatic chrome plating plant consists of (1) the plating vat, followed down the line by (2) the "drag-out" (in which vat the articles receive a swilling to remove the chromic acid), (3) neutralising tank (where any acid remaining is neutralised), (4) vat for cold swilling the articles, and (5) vat for hot final swilling. The plating vat is constructed of iron, lined with special harc lead and again lined with reinforced glass sheets. It is enclosed in a water-jacketed tank for heating purposes, which may be effected by gas, electricity, or steam. The vat is fitted with fume exhaust ducting which surrounds the surface of the plating solution. The fumes are drawn into an expansion chamber, and exhausted by ducting and a fan to the outer air. An air agitation coil is placed in the bottom of this vat so that the solution may be agitated when necessary. The articles to be plated are hung on cathode sus-

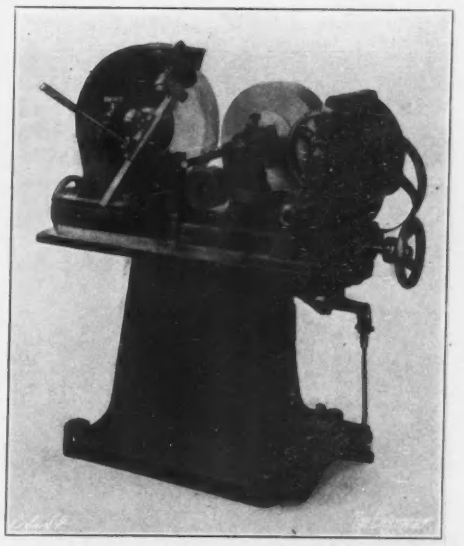

FIG. 15—CENTRELESS POLISHING MACHINE—CANNING

penders, and carried around the plating vat, and later down the line of "swills" by a chain conveyor, transferring mechanism (seen in Fig. 14) provided for lowering and lifting the loaded suspenders in and out of each vat at properly spaced times. The apparatus is provided with four speeds to permit variations of plating time.

There is also shown an electrically heated motor-driven sawdust barrel for the quick drying out of small articles after electro-plating, bright dipping, or wet barrel burnishing processes. The electric elements are controlled by switches interlinked with the motor

starter. Two-fifths of the heat is switched on in order to maintain heat in the barrel ; the other three-fifths is automatically switched on when the barrel is in operation, thus preventing waste of current and burning of sawdust.

Two centreless polishing machines for handling rods and tubes and articles of circular shape are shown. The smaller machine deals with tubes from 2in. long up to a maximum diameter of ½in., and other articles of circular shapes up to 2½in. diameter. The larger machine (Fig. 15) takes any length tubes up to 2in. diameter and other articles of circular shapes up to 6in. diameter. The circular profile work which can be done on these machines includes lids, bushings, hubs,

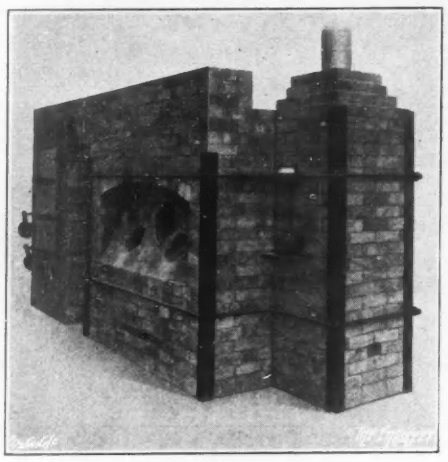

FIG. 16—GLASS-MANUFACTURING FURNACE—GAS SECTION

and articles of barrel shape, and small cycle and perambulator rims can be polished by the use of special fixtures. The feed wheel can be set at varying angles to determine the rate of feed.

Other exhibits on this stand include a new antimonoal lead anode for chrome plating, which is provided with greater thickness at solution level ; and plate-type rectifiers for use in place of A.C. motor generators, the necessary D.C. being obtained by connecting a transformer and rectifier to the A.C. mains.

The latest design of A.C. self-contained polishing motor is shown with starting equipment embodied in the machine casing, the wiring being ready for connecting to the electrical supply. A full range of electro-plating materials, polishing brushes and wheels, mops, bobs, and polishing compositions is also shown, including a new polishing wheel of the compress type, consisting of leather sections compressed with the end grain presented to take the abrasive. This " Duraflex " wheel is specially useful for polishing steel.

GAS SECTION.

The organisation of an industrial exhibit and a central information bureau has been undertaken by

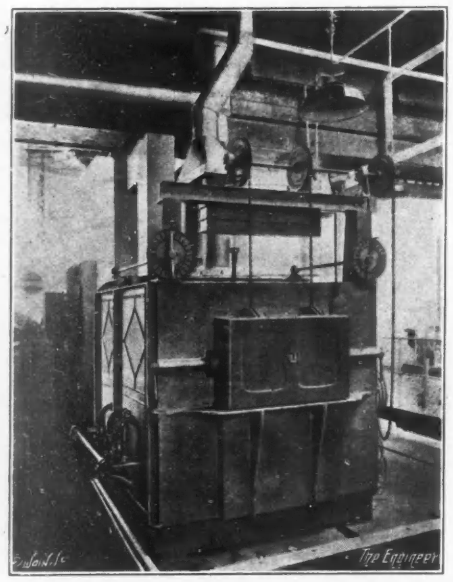

FIG. 17—BATCH TYPE OVEN FURNACE—GAS SECTION

the British Gas Federation. The industrial exhibit illustrates the development of modern town gas-fired furnaces to meet the needs of present-day manufacturing technique. Although, of course, it is impracticable to show large furnaces at such an exhibition, some idea of the large scale of modern gas furnaces may be obtained from a forge furnace which is shown working, and which has a working chamber 4ft. by 4ft. by 4ft. Another interesting exhibit is a complete glass-manufacturing plant, illustrated in Fig. 16, which includes a two-pot furnace, annealing furnace, pipe arch, and glory hole. Glass-blowing demonstrations are being given throughout the time of the exhibition. It will come as a surprise to many glass manufacturers that, though the pot furnace is only fitted with natural draught burners, the pot temperature is maintained at 1350 deg. Cent. This furnace forms a complete unit for the manufacture of glass hollowware, demonstrations of which are given daily throughout the run of the Fair. The unit consists of two 80 lb. glass pots, a glory hole, and triple annealing kiln. The makers are the South Metropolitan Gas Company, London, S.E.15, and Messrs. Gibbons Brothers, Dibdale Works, Dudley ; while the demonstrators are Webb's Crystal Glass Company, Stourbridge. Probably the most important section of the exhibit is devoted to the heat treatment of steel. A standard batch type oven furnace, having very thick insulation, efficient recuperators, and automatic control, making it particularly suitable for general-purpose work, including hardening, normalising, annealing, and case-hardening, is illustrated in Fig. 17. It is suitable for temperatures up to 1000 deg. Cent. The makers are the Incandescent Heat Company, of Smethwick, Birmingham.

Another exhibit is a G.L.C. gas-fired natural-draught pot furnace, illustrated in Fig. 18, which is suitable for cyanide and other types of salt bath hardening and case-hardening, lead hardening, and non-ferrous

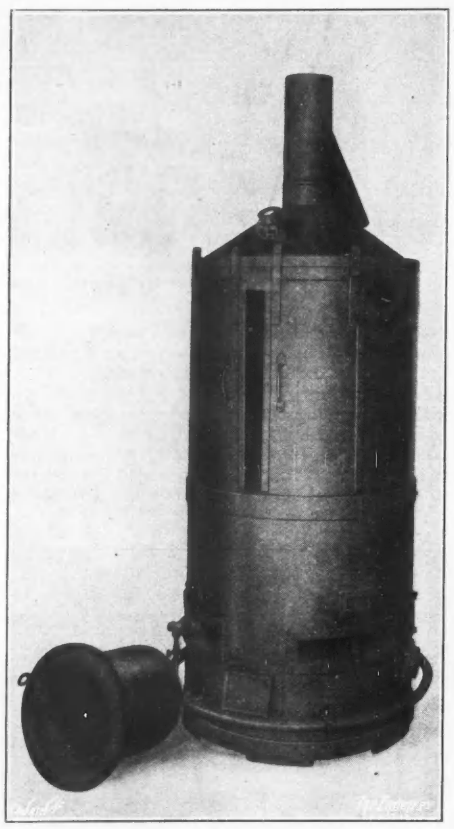

FIG. 18—NATURAL DRAUGHT POT FURNACE—GAS SECTION

metal melting. The combustion space is designed so as to give accurate control of secondary air, and therefore high efficiency, with no flame contact with the pot. This ensures long pot life. The makers are Brayshaw Furnaces and Tools, Ltd., Belle Vue Works, Manchester, 12 ; British Furnaces, Ltd., Derby-road, Chesterfield ; Incandescent Heat Company, Smethwick, Birmingham ; and Manchester Furnaces (1924), Ltd., Globe Works, Ashton New-road, Manchester, 11.

A variety of salt baths and high-speed steel-hardening furnaces are also being demonstrated. The recent advances in salt bath hardening processes make the salt baths of particular interest, while the controlled-atmosphere high-speed steel furnace is also well worth examining. Other exhibits are non-ferrous metal melting furnaces, one of which is of the semi-rotary reverberatory type ; a plastic moulding press which is shown at work ; an oxygen cutting machine for precision work ; a recirculated atmosphere furnace for tempering and drying processes, and a series of small modern muffle furnaces. Boilers and burner equipment of all kinds make up a most comprehensive display.

An interesting exhibit in the section is a twin-cylinder gas-engine-driven electric generating plant built by R. A. Lister and Co., Ltd., for one of the gas companies. It is a 6-kW machine, and the largest of a series of units supplied by the firm with designed outputs of 1·25 kW, 2·5 kW, 3 kW, 5 kW, and 6 kW. The engine is of the firm's standard vertical pattern with magneto ignition, and it operates on the four-stroke principle, the running speeds for the whole range of engines varying from 550 to 650 r.p.m. With a gas fuel having an average calorific value of 460 B.Th.U. per cubic foot, the usual consumption is from 28 to 32 cubic feet per b.h.p.-hour. These plants can be arranged for direct running, battery charging, or fully automatic operation, the last mentioned being on the Lister Bruston principle, whereby a comparatively small capacity battery deals with requirements up to a predetermined figure. Upon exceeding this figure the plant automatically starts up and deals with the load, continuing to run until such time that the demand for current is reduced to just below the figure at which the equipment started. The battery

FIG. 19—NATURAL-DRAUGHT MUFFLE FURNACE—GAS SECTION

then again takes over and deals with the relatively small needs.

A G.L.C. natural draught gas-fired muffle furnace is illustrated in Fig. 19. The furnace, which is particularly well finished and efficient, is suitable for laboratory and small-scale production work at temperatures up to 1000 deg. Cent. A modified form of the furnace still using natural draught is available for use up to 1250 deg. Cent. The makers are Selas Gas and Engineering Company, Ltd., Selas Works, City-road, Manchester ; Baird and Tatlock (London), Ltd., 14, Cross-street, E.C.1 ; and Brayshaw Furnaces and Tools, Ltd., of Belle Vue Works, Manchester, 12.

MOSS GEAR COMPANY, LTD.

A large range of gear units is exhibited by the Moss Gear Company, Ltd., of Tyburn, Birmingham, including the firm's range of " High Power " fan-cooled worm gear units from 3in. centres to 15in. centres, suitable for transmitting from 0·5 to 100 h.p. The inverted type up to 80 h.p. is also shown. Helical gear units are represented as are single and double-reduction gear motor units for flange-mounted motors from 1 to 15 h.p. with reductions of 2 to 1 down to 23 to 1. Worm gear units for fractional horse-powers and double-reduction worm gear units from 0·1 h.p. to 15 h.p. with reduc-

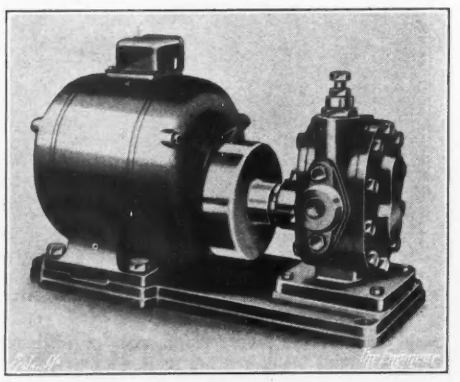

FIG. 20—HIGH-PRESSURE GEARED PUMP—MOSS GEARS

tions up to 2400 to 1 are on view, as is a 7in. by 10in. deep-well pump power head in motion. This exhibit represents the firm's well-known range of pumps. Finally, the high-pressure geared pump, illustrated in Fig. 20, is shown fitted with a 2·666/1 reduction gear and motor on one bed-plate, making a self-contained unit. Pressures up to 1000 lb. per square inch are available, an automatic relief valve is fitted, and a by-pass chamber is included in the pump body. The motor speed is 1450 r.p.m.; 1 h.p. rating will give 125 lb. pressure ; 2 h.p., 375 lb.; 3 h.p., 500 lb. pressure. The pump is fitted to a tank and compression cylinder for demonstration purposes. Pump bodies can be made in special alloy materials to

suit special liquids, and the figures given are for a viscous liquid such as oil. The pump is driven by spur and helical gears.

DESOUTTER BROS., LTD.

The electric screw gun shown in Fig. 21 is one of the exhibits of Desoutter Bros., Ltd., of The Hyde, Hendon, N.W.9. The spring-loaded clutch mechanism is readily adjustable for driving any size screw within the capacity of the tool, and additional clutch units are supplied separately to enable a quick change over to be made from one size screw to another when necessary on a particular assembly. The motor which drives the clutch through heat-treated nickel-chrone-molybdenum helical gears can be wound to suit all standard voltages. Spare brushes are accommodated in the machine.

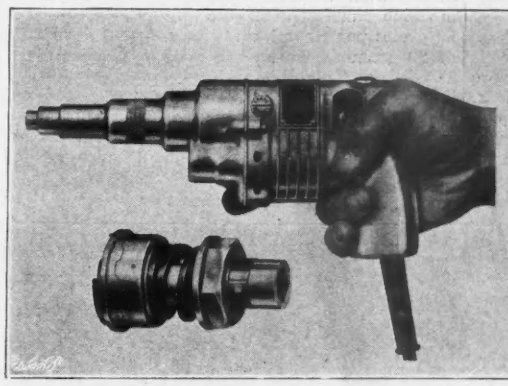

FIG. 21—ELECTRIC SCREW GUN

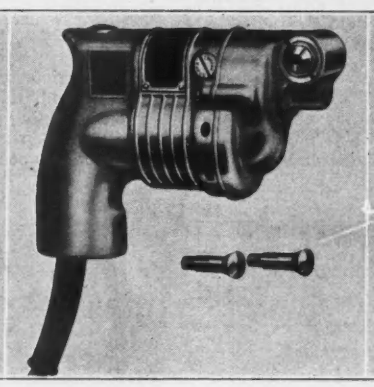

FIG. 22—ELECTRIC "CORNER DRILL"

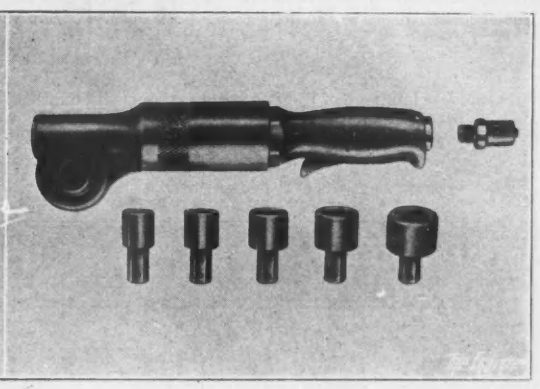

FIG. 23—ROTOR SPANNER—DESOUTTER

The electric "corner drill," Fig. 22, has been introduced by the firm to meet the need for a tool capable of drilling in difficult positions. The right angle drilling spindle is arranged for collet type chucks capable of accommodating drills from $\frac{1}{16}$in. to $\frac{1}{4}$in. Among other exhibits on the stand is the rotor spanner, Fig. 23, for the rapid tightening of nuts up to $\frac{1}{2}$in. The drive is in the form of a female hexagon, into which various sizes of box spanners are inserted. The spanners are retained in position by a spring ball and are readily interchangeable. They can also be fitted so that they give a reverse action for dismantling and operating on left-hand threads.

MASS PRODUCTS, LTD.

The stand of Mass Products, Ltd., Parkstone, Dorset, contains a representative range of Humphris patent power presses. In addition to the open-fronted and inclinable presses which were exhibited last year, a new range of straight-sided presses is shown. These presses are made in sizes of 50–1250 tons capacity, and are specially suitable for heavy blanking, drawing, and coining operations. They can be fitted with the Humphris patent gripper feed mechanism, similar to that fitted to the open-fronted and inclinable presses, if desired. A 15-ton open-fronted high-speed press is fitted with the Humphris patent gripper feed mechanism, and equipped with wind-off and on reels. It has a two-speed motor giving ram strokes of 200 and 390 strokes per minute, and has an adjustable crank throw of $\frac{1}{2}$in. or $1\frac{1}{4}$in. The gripper feed is of the standard pattern, with the addition of a mechanically-operated positive grip on the in-going gripper to eliminate any chance of slip when running at high speed. All the castings of the moving parts of this press and feed are made from hiduminium to ensure lightness with strength and stock. The top rolls of the ingoing and outgoing rolls can be raised by means of handles for rapidly inserting or withdrawing stock. Pressure on the top rolls is provided by adjustable spring pressure. When required, the top rolls can be raised by means of adjustable stops on the ram just before the bottom of the stroke, so that stock can be brought into exact position by means of pilots. The feed can also run

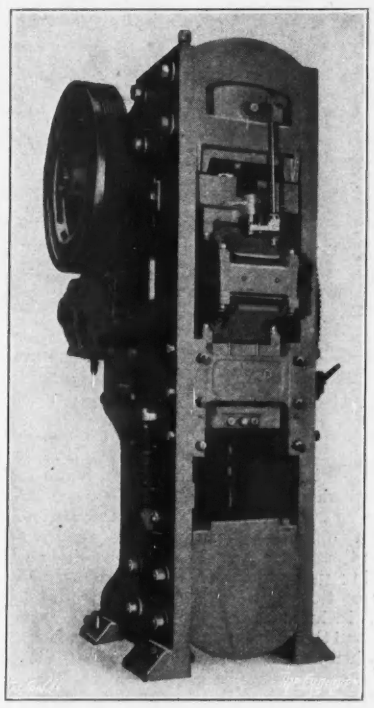

FIG. 24—300-TON STRAIGHT-SIDED PRESS —MASS PRODUCTS

to reduce vibration to a minimum. A 45-ton open fronted press is fitted with a double roll feed. This machine is one of a range for capacities of 6 to 80 tons, which are made with upright or inclinable without releasing the rolls when it is desirable to maintain a grip on the stock. A 100-ton double-sided geared press fitted with the gripper feed mechanism is exhibited, and also a 50-ton double-sided frames and either geared or ungeared. The double roll feed is driven from the end of the crank shaft through a silent friction lock spur wheel, which grips instantly and gives accurate feeding. The length of the feed is readily adjustable by means of a screw on the crank disc. A small table with adjustable gauges is provided at the entrance to the rolls for guiding the ungeared press. This latter machine is driven by Texrope and is fitted with top and bottom ejectors. It is shown performing a coining operation. A 300-ton straight-sided press is illustrated in Fig. 24. It is fitted with top ejectors and rolling key clutch. This is a special machine with 6in. stroke, $1\frac{1}{2}$in. adjustment, 24in. width between sides, bolster to ram (strokes down, adjustment up) $12\frac{1}{2}$in., ram face 18in. by 18in., strokes per minute 40.

Another interesting exhibit, illustrated in Figs. 25 and 26, is the Humphris gang slitting machine, which is shown in operation slitting 19 B.W.G. sheets. This machine is capable of trimming sheets up to 36in. wide and slitting to a minimum width of $1\frac{3}{4}$in. The table is fitted with an easily adjustable side gauge. Feeding out tools maintain a slight tension on the stock, and as the cutters are ground on the sides and not on the outside diameter, the proper speed relation is maintained. A motor-driven grinding attachment is provided, so that when the cutters become dull they can be reground in position. The shafts, running at 125 r.p.m., are carried in fixed bearings at the ends, and on account of their length additional supports are provided. These supports are movable to allow for any cutter arrangement. The cutters are mounted on hubs which are held in position on the shaft by special wedge keys in such a manner as to enable them to be instantly set for any width of cut.

CHASESIDE ENGINEERING COMPANY.

The Chaseside Engineering Company, of Enfield, London, is exhibiting the "Hi-Lift" shovel, which is generally similar to the model exhibited last year and described in the Fair Supplement of May 17th. This year the machine exhibited has a capacity of from 5 to 40 tons per hour. Loading up to 9ft. high can be carried out. The machine has detachable steel disc front wheels carried on steel hubs and heavy cast iron solid rear wheels which improve adhesion. The tires are 30in. by 5in. H.D. in front and 10·50in. by 20in. H.D. in rear, the rear tires, however, working with a maximum pressure of 45 lb. per square inch

The engine is a four-cylinder petrol model, giving 30 b.h.p. at 1000 r.p.m., splash lubricated. Cooling is by thermo-syphon and pump, and a large water jacket and radiator and extra powerful fan are fitted. The fuel consumption is about 1 gallon per hour of No. 3 spirit. The gears are of the constant mesh selective type, giving three forward and one reverse speeds. A forged front axle is used. The rear axle is semi-floating, four-pinion differential, and roller bearings are fitted. Ignition is by magneto with impulse starter. A multiple disc transmission foot brake and internal expanding type hand brake on the rear wheels are fitted. The frame is of 5in. by $2\frac{1}{4}$in. channel steel, electrically welded, with side arms of 6in. by 3in. electrically welded steel. The adjustable

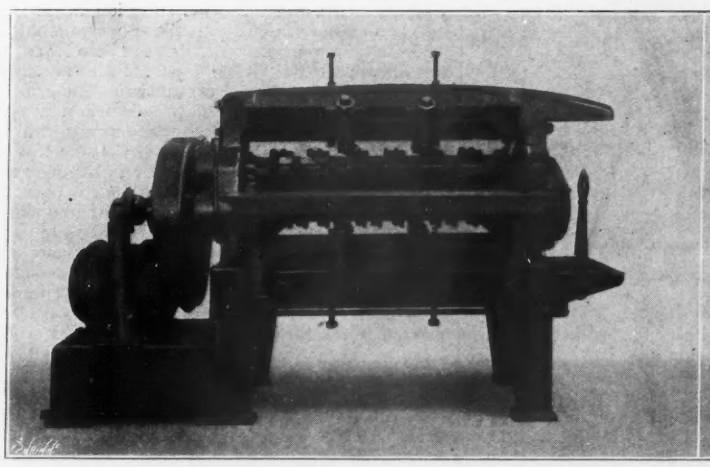

FIG. 25—HUMPHRIS GANG SLITTING MACHINE: FRONT VIEW

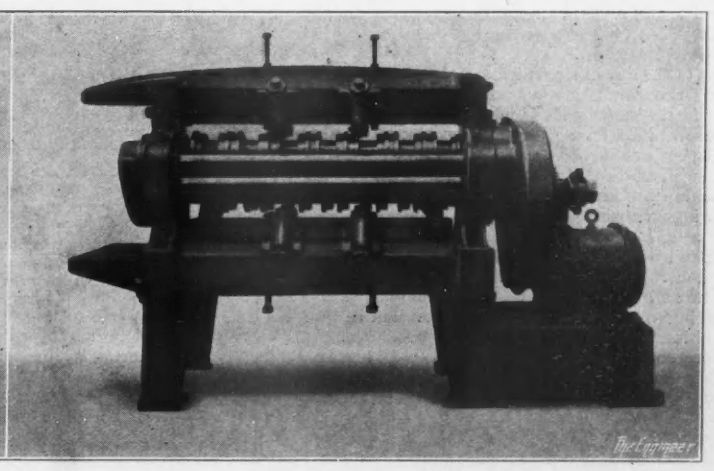

FIG. 26—HUMPHRIS GANG SLITTING MACHINE: REAR VIEW—MASS PRODUCTS

jib is 4in. by 2in. electrically welded steel, the scoop is of Chromadore steel, the scoop lip is of manganese steel, and the pulleys of cast iron, phosphor bronze bushed. British Plough steel rope is used, and safety stops are fitted on the jib to prevent overwinding. Two ballast boxes are outrigged at the rear. The winch has a double friction drive and double automatic brakes to prevent accidents. Renolds duplex chain drive is used. The foot brake and foot accelerator leave the driver with both hands free.

J. H. FENNER AND CO., LTD.

With the development of modern group drive belt systems are being brought into use again. The modern drive, however, is planned to fit the operating requirements of the factory, and is based more on production schedules and on machine operations than on the machinery itself. The shafts used are relatively short, of small diameter, and high rotational speed. They are carried in ball or roller bearings, and supported in such a way as to reduce bending and vibration to a minimum. Finally, the whole drive can easily be moved to a different position in the factory. With the development of modern drive technique, the development of the belt itself has gone on. Beltings manufactured from layers of cotton duck and rubber have been successfully applied for some time, but have always had the disadvantage that with only the rubber holding the plies together, it is difficult to prevent the belts skidding when they come in contact with steam or water. Solid woven beltings which have no plies have been employed for years, but as they can only be impregnated with black bitumen or oil, they are not perhaps so tough or so good at fastener holding as rubber and canvas belting. J. H. Fenner and Co., Ltd., of Hull, produce a solid woven belt impregnated with pure rubber, which is said to combine all the advantages of solid woven belts and rubber ply belts. This product, known as Z belting, is on view on the firm's stand. In addition, a running exhibit shows how the special braids used for the anti-friction edges of the belting are manufactured. Figs. 27 and 28 show opposite sides of the machines, which are of the high-speed type. They are absolutely automatic, each carrier being provided with a device which actuates the stop motion. The machine stops at a broken thread or empty bobbin and the broken thread is tightly held, so obviating a bad place in the work. The inner bobbins of the machine are carried on sixteen fibre pinions. Ball bearings are used on the outer wheels and main bearings. The receiving attachment to take the braid is fitted with adjustable slipping clutch and traverse motions. The machine which is illustrated was manufactured by the Standard Machine Works, Ltd., of Nottingham. Prior to the introduction of braiding machines, the edges for solid woven belts were made of coarse twisted cords, and it was only after a good deal of experimentation on the part of J. H. Fenner and Co. that it was found that more satisfactory results could be obtained by the use of closely braided cords. These cords are made in diameters from $\frac{1}{8}$in. to $\frac{1}{4}$in., and are composed of a number of fine strands of cotton yarn braided around a core of the cabled cotton type. In use, these braids, after rubberising, stand up remarkably well to the action of guide forks. Instead of fraying away, they resist the forks and even under the most severe conditions of service they continue to stand up. With the old type of cord, it was often found that the protective edge was worn away and the load-bearing warp strands were damaged by the forks, but in the case of belts which are made with these special braids, there is little or no danger of this happening.

FERRANTI, LTD.

Many things familiar to electrical engineers are exhibited by Ferranti, Ltd., of Hollinwood, Lancs. There are examples of the Ferranti moving coil regulator, tail end booster and mercury step regulator. The simplicity of the firm's automatic-control gear for regulating equipment is exemplified by a relay control panel and the copper disc motor used to drive the regulator. Other exhibits in the transformer section of the stand are a surge absorber, a model surge demonstration set, a portable D.C. testing set, and a model of the Ferranti oil-sealed calcium chloride breather. In the instrument section there are examples of various kinds of meters, including prepayment meters. Besides the simple meter of this type there are various developments of it, including the two-part tariff prepayment meter and the triple optional coin meter with moulded insulation covers and ordinary metal covers. To demonstrate points of interest in connection with meter production a simple high-speed gearing device with indicating pointers is shown to demonstrate the method adopted for checking the accuracy of gear ratios in meter trains, and a simple method of testing meter shunt coils to ensure freedom from short circuits and to check the number of turns. A stroboscopic device exhibited serves for applying a preliminary test to all meters at full and half load. Another equipment, Fig. 29, is used for the inspection of every meter under intense illumination and with a high degree of visual magnification. On a typical meter test bench maximum demand equipment and summation meters figure prominently. There are also time switches of the synchronous motor type for various purposes. The synchronous motor used in this connection is a self-starting machine running at 200 r.p.m. at a frequency of 50 cycles per second, and has a synchronous torque of 20 gramme centimetres with a consumption of 1·4 watts. There is a wide range of instruments for indicating purposes, a light tester with a dual range of 0–25 and 0–250 foot-candles, a multi-range test set suitable for A.C. or D.C., and some small electrostatic voltmeters. Mention should also be made of a varied selection of relays including the Ferranti maximum demand alarm relay, as described in our issue of January 24th. Another section of the stand is devoted to high-quality and precision castings, including castings in " no-mag " iron.

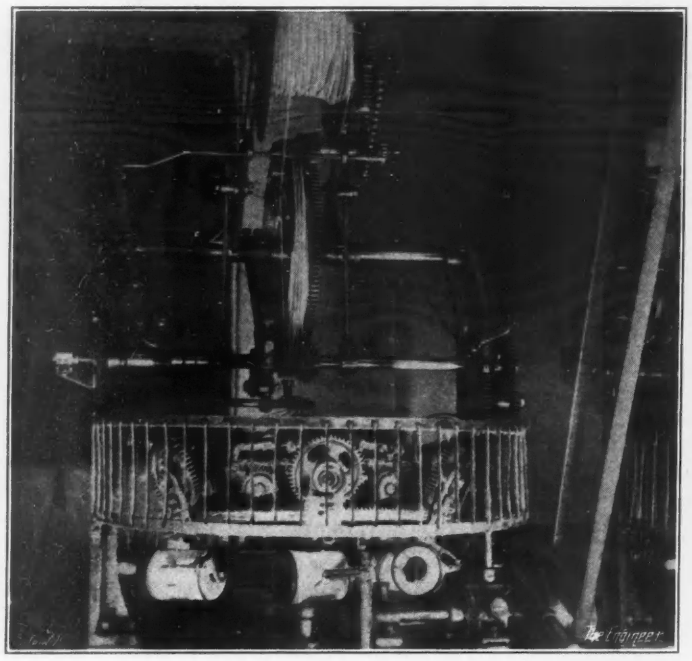

FIG. 27—BRAID MANUFACTURING MACHINE, FRONT VIEW—FENNER

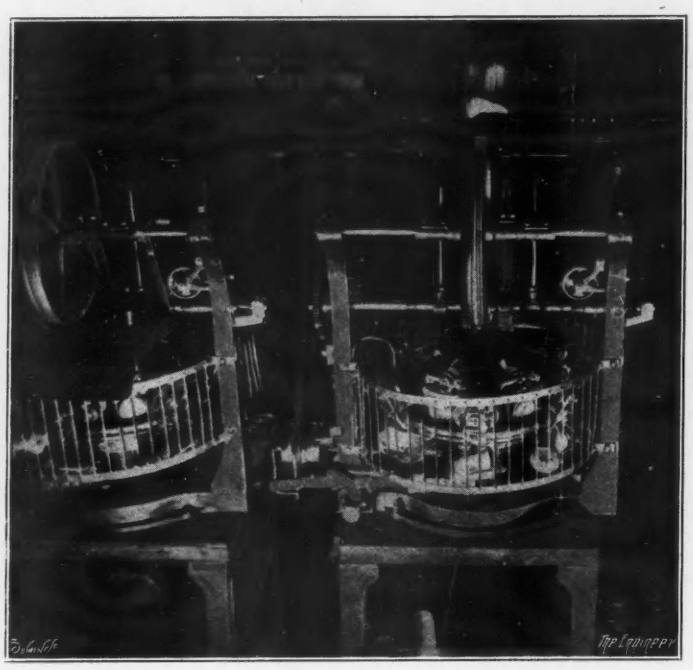

FIG. 28—BRAID MANUFACTURING MACHINE, REAR VIEW—FENNER

FIG. 29—APPARATUS FOR METER INSPECTION—FERRANTI

JOHNSON'S IRON AND STEEL COMPANY, LTD.

A varied selection of materials is on view on the stand of Johnson's Iron and Steel Company, Ltd., of Hall End Ironworks, West Bromwich.

In the foundry section the exhibits range from a few pounds to 17 tons in weight. Both chilled and grain cast iron rolls are shown in the finished turned condition, ready for mounting in the rolling mill. Chilled alloy rolls are also shown. In the rolling mill and forge exhibits, attention is drawn to the wrought iron, which includes some samples known to be at least 1700 years old, also to an example of a ball of raw puddled iron, as drawn from the furnace, and before the necessary work to convert it into wrought iron has been put into it. The range of this department includes 7in., 15in., and 20in. mills. In the constructional department, the chief exhibit is the colliery arches, with their attendant accessories, of which a wide selection is on view. Models of the various patents are available for demonstration purposes. Attention here is particularly drawn to the " Schat " patent lifeboat skates, of which a finished pair are shown. These are of great interest in view of the prominence now given to the all-important question of the safety of life at sea. These skates, made to fit over the side of a lifeboat from the keel to the transom, and having extensions extending well over the height of a passenger seated in the boat, to enable a boat to be slid down the side of a ship which is heeled over. The boats on the upper side, which are normally useless, are thus available for use. The skates prevent the bottoms of boats being ripped open by plate edges. They also prevent the boats being capsized on the hull during lowering on a listed ship. The skates also enable boats to skate down the hull on the high side with safety to the boats and their passengers, and prevent damage when lowering with a rolling ship. They keep the lifeboats clear of all obstructions on the ship's side, and enable boats to be kept pressed against the ship's side, by turning the davits back inboard, without risk of smashing the boats.